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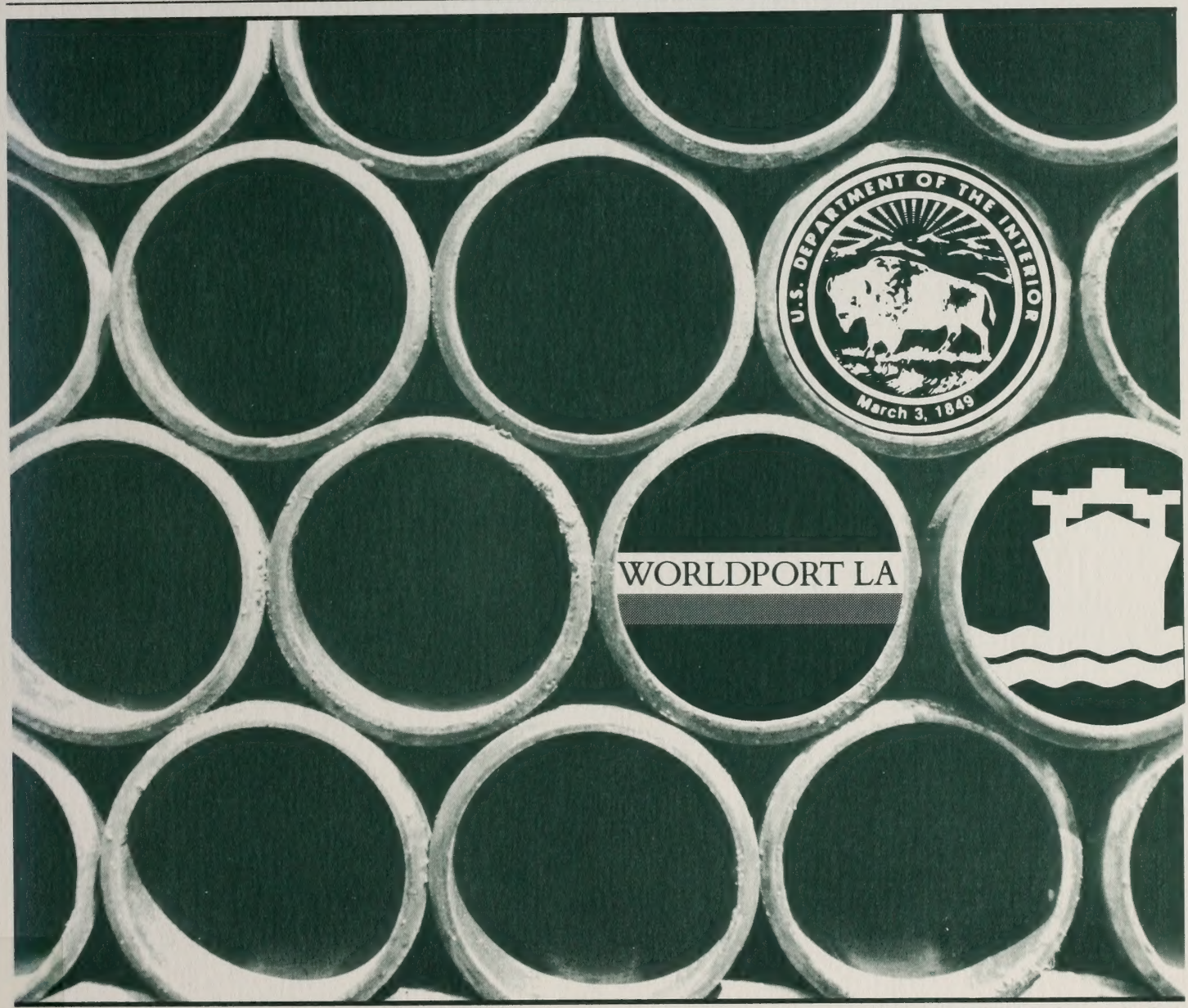
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DRAFT

PROPOSED

PACIFIC TEXAS PIPELINE PROJECT

LOS ANGELES HARBOR DEPT. AND BUREAU OF LAND MANAGEMENT DEPT. OF THE INTERIOR



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Los Angeles Harbor Department
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Department of the Interior

Draft

ENVIRONMENTAL IMPACT REPORT/ ENVIRONMENTAL IMPACT STATEMENT for the proposed PACIFIC TEXAS PIPELINE PROJECT

prepared by

LOS ANGELES HARBOR DEPARTMENT
and
BUREAU OF LAND MANAGEMENT

cooperating agencies

- U.S. ARMY CORPS OF ENGINEERS
  LOS ANGELES DISTRICT
  (PERMIT APPLICATION NUMBER 85-97)
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JUNE 1985

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U.S. DEPARTMENT OF THE INTERIOR
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Riverside, California 92507

PORT OF LOS ANGELES
425 S. Palos Verdes Street
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San Pedro, CA 90733-0151

Formal public hearings to accept public testimony and comments on the adequacy of this Draft Environmental Impact Report/Environmental Impact Statement covering the proposed Pacific Texas Pipeline Project, which is the subject of this document, will be conducted by an Administrative Law Judge during the week of July 22-26, 1985, at the following locations:

MONDAY, July 22	SAN PEDRO, CALIFORNIA Harbor Commission Meeting Room 425 S. Palos Verdes, 2nd Floor
TUESDAY, July 23	PALM SPRINGS, CALIFORNIA City Council Chambers 3200 Tahquitz-McCallum Way
WEDNESDAY, July 24	PHOENIX, ARIZONA County Supervisors Auditorium 205 W. Jefferson Street
THURSDAY, July 25	EL PASO, TEXAS City Council Chambers Santa Fe & Missouri Streets
FRIDAY, July 26	MIDLAND, TEXAS City Council Chambers 300 N. Loraine Street

ALL HEARINGS WILL BEGIN AT 7:00 p.m.

Written testimony should be submitted in duplicate to the court reporter.

The Administrative Law Judge may set a time limit on oral testimony from any individual or organization. Persons wishing to assure that their testimony becomes a part of the permanent record of the proceedings should be prepared to present an oral summary of any written testimony they wish to present. All testimony -- written or oral -- will be used in preparing the Final EIR/EIS.

Persons unable to attend the formal public hearings, but wishing to provide comments on this document should submit their written comments to the Bureau of Land Management Office listed above no later than midnight, August 5, 1985.

COVER SHEET

PROPOSED PACIFIC TEXAS PIPELINE PROJECT

(X) Draft

Lead Agencies	Los Angeles Harbor Department, San Pedro, California U.S. Department of the Interior, Bureau of Land Management, Riverside, California
Cooperating Agencies	U.S. Department of the Interior, Fish and Wildlife Service, Region Five U.S. Army Corps of Engineers, Los Angeles District
EIR/EIS Contact	William Haigh, Federal Project Manager Bureau of Land Management 1695 Spruce Riverside, California 92507 (714) 351-6428
	W. Calvin Hurst, Harbor Environmental Scientist Los Angeles Harbor Department P.O. Box 151 San Pedro, California 90733-0151 (213) 519-3675

Comments on this EIR/EIS should be directed to Mr. Haigh.
Date when comments must be received: August 5, 1985

ABSTRACT

The Pacific Texas Pipeline Company (Pactex) proposes to construct a $1.6 billion, 42-in.-diameter unheated pipeline. This pipeline would transport up to 900,000 barrels per day of excess Alaska North Slope, California outer continental shelf, and Pacific rim crude oil from the west coast through California, Arizona, New Mexico, and Texas to existing crude oil networks that service refineries in the U.S. gulf coast and the midwest. The applicant proposes to construct (1) a 115-acre landfill island with a 75-ft-deep channel for access in the Port of Los Angeles (POLA) for the offloading and temporary storage of crude oil delivered by tankers, (2) a 70-acre tank farm in POLA, (3) about 1,030 miles of buried pipeline, (4) 11 pump stations, and (5) a 100-acre tank farm at the Midland, Texas, pipeline terminus. This EIR/EIS analyzes the construction and operation environmental effects of the proposed project.

The EIR/EIS analyzes in detail the impacts of the Pactex project and three alternatives: (1) Coachella Valley pipeline routing alternative that avoids critical habitat of the Coachella Valley fringe-toed lizard, (2) Landfill Island Alternative 1 (96-acre landfill with 70-ft-deep channel access), and (3) Landfill Island Alternative 2 (170-acre landfill with 75-ft-deep channel access). The no-project alternative was also considered.

This EIR/EIS has been prepared according to the requirements of the National Environmental Policy Act of 1969 (NEPA), the Council of Environmental Quality's regulations for implementing NEPA, effective July 30, 1979, and the California Environmental Quality Act, as amended. Based on the issues and concerns identified during the scoping process, the EIR/EIS focuses on the impacts to air quality, system safety, employment, the need for the project, port alternatives, national security, oil spills, and restoration.

This document serves as a NEPA compliance document for the U.S. Army Corps of Engineers (COE) for its permitting activities. The EIR/EIS contact for the COE is Nancy Farrell [(213) 688-0243].

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SUMMARY

SUMMARY

S.1 INTRODUCTION

The Pacfic Texas Pipeline Company (Pactex) EIR/EIS is a joint document prepared by the City of Los Angeles Harbor Department (LAHD) and the Bureau of Land Management (BLM), U.S. Department of the Interior to fulfill the requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). These two agencies, in coordination with the Federal cooperating agencies of the U.S. Army Corps of Engineers (COE) and the U.S. Fish and Wildlife Service (FWS), Region V, have directed the preparation of this joint Federal and state document.

The proposed pipeline project could transport excess Alaskan North Slope, California outer continental shelf (OCS), and Pacific rim crude oil from the west coast through California, Arizona, New Mexico, and Texas to existing crude oil transportation networks that service refineries in the U.S. gulf coast and midwest. The Pactex project would transport up to 900,000 barrels per day (bpd) through a 1,030-mile-long, 42-in.-diameter buried pipeline.

The pipeline would begin at a terminal storage facility on a landfill island to be constructed in the Port of Los Angeles (POLA). The fill area would encompass 115 acres. A channel and turning basin would be dredged to -75 ft mean lower low water (MLLW). The dredge material would be used to construct the island. The pipeline would proceed in an easterly direction 228 miles, approximately paralleling route I-10 to Blythe, California. From Blythe, it would proceed easterly crossing the Colorado River and would continue after the first 60 miles, which go north of the Kofa National Wildlife Refuge, parallel to and in a common utility corridor with an existing natural gas line through Arizona and New Mexico to Pine Springs, Texas (approximately 612 miles). From Pine Springs, the pipeline would continue to parallel natural gas pipelines, proceeding northeasterly, reentering New Mexico, and then proceeding due east to a receiving terminal at Midland, Texas (approximately 191 miles). Other facilities would include 11 pumping stations.

In addition to the proposal, one pipeline routing alternative and two landfill island alternatives were considered in detail. The Coachella Valley routing alternative would depart from the proposed project at Garnet, California, proceeding along a more southerly route along I-10 and the Southern Pacific Railroad right-of-way (ROW) for 22 miles, to rejoin the proposed project route at Myoma, California. The Coachella Valley route would avoid the U.S. FWS-designated critical habitat of the Coachella Valley fringe-toed lizard, a Federally listed threatened and California-listed endangered species. The Landfill Island Alternative 1 would involve dredging to -70 ft (versus -75 ft) in the POLA and a corresponding decrease in island size to a fill area of 96 acres. The Landfill Island Alternative 2 would include revetment on all sides of the island with an equal loss of soft

bottom (benthic) habitat relative to the proposed project. There would be an increase in the fill surface area to 170 acres. The no-project alternative was also evaluated.

Alternatives considered but eliminated from detailed analysis included alternative sites for terminal facilities in POLA, alternative berthing locations in San Pedro Bay, minimum facilities alternatives, and the use of electric pumps on tankers. Other alternatives previously considered and found to be not viable included alternative pipeline systems, export of crude oil, and alternative transportation modes.

Pactex has applied for ROW permits from the BLM to cross Federal lands and from the State Lands Commission to cross land at the Colorado River. Pactex has also applied to LAHD for a lease permit to construct a berthing/terminal facility. The project would also require approval by the California Coastal Commission. Pactex would require Section 10 (River and Harbors Act, 1899) and 404 (FWPCA, 1972) permits to cross the Colorado River, Section 404 permits for all other river crossings, and Section 10 and 404 permits for work in the harbor. Numerous other Federal, state, and local permits would be required.

S.2 AREAS OF CONTROVERSY

Areas of controversy associated with the Pactex proposal include impacts resulting from the development of a landfill island, as well as construction and operation impacts of the pipeline at several locations along the proposed route. The need for the project is also an area of controversy because of the uncertainties surrounding the future surplus of PADD V crude oil.

The construction of the proposed landfill island within the harbor would create a loss of benthic habitat. The potential for the short-term disruption of foraging areas of the California least tern, an endangered species, is also a controversial issue. The island would be located in an area of potential seismic activity; therefore, the nature of the dredge material could create potential for liquefaction and concomitant potential for damage to facilities. The resultant safety and oil spill issues are likely to be areas of controversy. Potential air pollution impacts are an area of controversy in the Los Angeles Basin.

Along the pipeline route, areas of controversy include construction through sensitive areas, including the Coachella Valley fringe-toed lizard critical habitat and the Muleshoe Nature Preserve. The crossing of rivers and streams would create temporary construction impacts, and a controversial issue is the potential for oil spills into these waters. Major oil spills could also contaminate sensitive groundwater basins.

S.3 MAJOR IMPACT CONCLUSIONS

The Pactex pipeline system proposal has potentially significant construction and operation impacts. Construction impacts in the POLA area would result primarily from dredging and landfilling activities. Construction impacts along the pipeline ROW would result primarily from clearing, trenching, and

backfilling construction activities and by the presence and need of the labor force. Operation impacts would result primarily from potential oil spills and leaks.

Significant impacts have been analyzed in detail in Section 4 of this draft EIR/EIS, and mitigation measures have been developed. Tables S-1 through S-4 (at the end of this section) summarize the significant impacts that would result from the implementation of the Pactex proposal and the routing and island alternatives. These tables include the planned mitigation measures presented in Section 4, and they are annotated by numbers that refer to the planned mitigation measures developed for each discipline in subsection 4.7. These summary tables also indicate whether the impact would still be significant after implementation of these mitigation measures.

S.4 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

Section 15123 of the state CEQA guidelines requires that an EIR contain a brief summary that identifies the issues to be resolved, including the choice among alternatives.

Two pipeline ROW routes are considered and three alternative landfill cases. Relative to the Pactex proposal, the alternative pipeline route avoids the critical habitat of the Federally listed threatened and state-listed endangered Coachella Valley fringe-toed lizard. The other difference in impact is that the alternative pipeline route is an average of 2.5 miles farther from any known paleontologic or cultural resource than the Pactex proposal. The advantage of the proposed project relative to the alternative is that the pipeline would be 2 miles shorter and would cost slightly less.

Two landfill island alternatives are compared to the proposal: Alternative 1 would require less dredging than the Pactex proposal and would have reduced benthic habitat loss. Alternative 2 would require the same amount of dredging and would have the same area of habitat loss; however, Alternative 2 would require a longer construction time. The relative benefits of the Pactex proposal are that all project objectives would be met and that the POLA policy of providing maximum setback between the oil storage tanks and tankers at berth would be achieved (relative to Alternative 1).

Alternative 1 would have fewer impacts on the benthic habitat and would cost less. This alternative would be less desirable from the standpoint of safety because the setback of the oil storage tanks would be 400 ft less. Also, this alternative would not fully meet the objectives of the project because the -70-ft (MLLW) dredge depth would impose operational constraints on the tanker deliveries.

Alternative 2 would have the same impacts as the Pactex proposal on the benthic habitat, safety, and meeting the project objectives. A benefit of Alternative 2 is that the risk of liquefaction from a seismic event could be reduced. A disadvantage is that the cost would be greater and the construction time would be longer. However, it is possible that this alternative would not meet the schedule requirements of the project.

S.5 AGENCY PREFERRED ALTERNATIVE

The preferred alternative stated below is not a final agency decision; rather, it is an indication of the Federal agency's preliminary preference. The preference identified below is that of the BLM, the Federal lead agency.

Construction of the proposed Pactex pipeline as mitigated in this document is BLM's preferred alternative.

The preferred alternative in the Coachella Valley is the applicant's proposed route. This route would cross 3 miles of the proposed Coachella Valley Preserve and 6.2 miles of the U.S. Fish and Wildlife Service-Designated Critical Habitat for the Fringe-toed Lizard, neither of which would be crossed by the alternative. However, field studies conducted for this draft EIR/EIS show that the applicant's proposed route would cross 0.9 mile of mixed suitable and nonsuitable lizard blowsand habitat rather than the 5.1 miles that would be crossed by the alternative. Of this mixed habitat, only 0.4 mile is estimated to be suitable, compared to the 0.6 mile that would be crossed by the alternative. The draft Coachella Valley Fringe-Toed Lizard Habitat Conservation Plan (HCP, 1984) states that "the construction of additional utility lines, pipelines, and attendant roads are acceptable use under the HCP" (p. VI-9).

Table S-1 - Summary of Significant Impacts for the Pactex Proposal

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Air Quality				
Construction	Exhaust from heavy-duty construction equipment	1	Reduce NO_x by 30% to 40% and SO_2 by 75%	No
	Fugitive dust from disturbed areas	7	Reduce short-term emissions (45 hr/ week) by approximately 50%	No
Operation	Tanker emissions while in the Port of Los Angeles (POLA)	4	Reduce particulates by 70% Reduce SO_2 by 90% Reduce NO_x by 90% Reduce reactive organic gases (ROG) by 90% Reduce CO by 90%	No
	Storage terminal reactive hydrocarbon emissions in POLA	3, 5	Net emission reduction in Los Angeles Basin through offsets	No
Geologic and Seismic Setting				
Construction	None identified	-	-	-
Operation	Potential landslide- and/or liquefaction-induced ground failure at the proposed landfill island in POLA	NA[b]	NA	Yes
	Potential ground rupture at fault crossings, including the Whittier-Elsinore, San Jacinto, and San Andreas faults	8	Minimize potential for pipeline rupture and minimize oil volume that would be spilled in the event of a rupture	Yes

Table S-1 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Geologic and Seismic Setting (Contd)				
Operation (Contd)	Potential damage to pipeline resulting from slope failure and/or creep	NA	NA	Yes
	Potential damage to pipeline from ground subsidence, including karstic collapse in west Texas[c]	43	Minimize potential risk by identifying risk areas and by frequent monitoring	No
Soils				
Construction	Erosion potential in Carlsbad Resource Area	9	Reduce potential for soil erosion	No
	Erosion potential along remaining route	NA	NA	Yes
Operation	Potential oil spills on sensitive soils in agricultural lands, including the Palo Verde, Gila River, and Rio Grande Valleys[d]	43, 44	Minimize corrosion damage and potential for pipe rupture	Yes
Surface Water				
Construction	None identified	-	-	-
Operation	Channel degradation could expose pipeline and increase possibility of pipeline failure	12, 46	Minimize potential for stream scour-induced pipeline failure	No

Table S-1 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Surface Water (Contd)				
Operation (Contd)	Major oil spills would degrade water quality below Federal and state standards[d]	10	Minimize quantity of oil spilled and time for cleanup in event of pipeline rupture	Yes
Groundwater				
Construction	None identified	-	-	-
Operation	Potential oil spill contamination of sensitive groundwater basins (see Tables 3.2.5-1 and 3.2.5-2)[d]	NA	NA	Yes
Freshwater Biology				
Construction	Potential reduction in diversity and abundance of important fish species caused by fuel or lubricant spills in the Colorado River, Gila River, Hot Springs Canyon Creek, Bass Canyon Creek, Rio Grande, and Pecos River	NA	NA	Yes
	Loss of Colorado squawfish, humpback sucker or bonytail due to construction activities or alteration of habitat	NA	NA	Yes
	Construction in streams of Muleshoe Nature Preserve may interfere with spawning and hatchling stages of Gila chub	NA	NA	Yes

Table S-1 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Freshwater Biology (Contd)				
Operation	Potential reduction in diversity and abundance of important fish species caused by major oil spills in the Colorado River, Gila River, Hot Springs Canyon Creek, Rio Grande, and the Pecos River	NA	NA	Yes
Terrestrial Biology				
Construction	Loss of riparian habitat and associated wildlife species	NA	NA	Yes
	Loss of ironwood washes and wash woodlands	NA	NA	Yes
	Loss of palm oasis	14	Eliminate impact	No
	Loss of potential least Bell's vireo habitat in the Whittier Narrows area	NA	NA	Yes
	Construction vehicle use off right-of-way (ROW) affecting sensitive wildlife and sensitive plants or communities	NA	NA	Yes
	Loss of individual desert tortoises and their habitat	NA	NA	Yes

Table S-1 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Terrestrial Biology (Contd)				
Construction (Contd)	Loss of Coachella Valley fringe-toed lizards and other sensitive wildlife species associated with the blowsand ecosystem	17	Reduce numbers lost or injured and amount of habitat disturbed	Yes
	Disturbance to bighorn sheep lambing in the Plomosa Mountains	16	Eliminate impact	No
	Disturbance causing raptor nest abandonment and loss of wildlife habitat in the Muleshoe Nature Preserve	15	Minimize impact	No
	Loss of threatened/endangered plants, including Sneed's pincushion cactus, gypsum wild buckwheat, Lloyd's hedgehog cactus, and McKittrick pennyroyal	14	Eliminate impact	No
	Loss of Federal candidate plant species (subsection 4.2.7.G)	14	Eliminate impacts	No
Operation	Colorado River spill affecting wetlands, waterfowl, and Yuma clapper rail (Federally listed - endangered)	NA	NA	Yes
	Loss of riparian habitat and associated wildlife species in the Muleshoe Nature Preserve caused by an oil spill	NA	NA	Yes
Socioeconomics				
Construction and operation	None identified	-	-	-

Table S-1 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Land Use and Recreation				
Construction	None identified	-	-	-
Operation	Disruption of recreational activities in POLA area in the event of a major oil spill from the pipeline or tanker	34, 45, 47	Help minimize the size and spread of an oil spill	Yes
Transportation, Energy, Utilities, and Public Services				
Construction and operation	None identified	-	-	-
Cultural Resources				
Construction	Damage or loss of sites eligible or potentially eligible for listing on the National Register	22, 23	Avoid or alleviate adverse impacts to cultural resources	No
Operation	Potential for unauthorized access to and collection of cultural resources	22 (o, p)	Avoid or alleviate adverse impacts to cultural resources	No
Paleontology				
Construction	Potential loss of fossils in highly important areas on Federal land by construction and unauthorized collection of fossils	24	Avoid or reduce adverse direct and indirect impacts to paleontologic resources	No

Table S-1 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Paleontology (Contd)				
Construction (Contd)	Potential loss of fossils in moderately important areas on Federal land and highly/ moderately important areas on local agency and private land by construction and unauthorized collection of fossils	NA	NA	Yes
Operation	Increased potential for unauthorized collection of fossils in highly important areas on Federal land	24	Reduce adverse indirect impacts to paleontologic resources	No
	Increased potential for unauthorized collection of fossils in moderately important areas on Federal land and highly/ moderately important areas on local agency and private land	NA	NA	Yes
Visual Resources				
Construction and operation	None identified	-	-	-
Noise				
Construction	Temporary exceedance of ambient levels at residences, schools, and parks along the pipeline ROW	NA	NA	Yes
Operation	None identified	-	-	-

Table S-1 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Oceanography and Marine Biology				
Construction	Loss of 208 acres of deep soft bottom habitat from fill and dike before consideration of marine habitat gained from other island components	36	Reduce impacts on marine resources and habitat	Yes (see Appendix I.6)
	Generate turbidity and associated water quality impacts on DO, transparency, and settleable solids	26 to 29	Minimize potential for significant water quality impacts through monitoring, regulatory standards, dredge methods, and turbidity containment	No
	Decreased utility of shallow water habitat and possible impacts on breeding success of California least tern from pipeline construction in the shallow habitat during April-to-September breeding season	30	Minimize impacts on the least tern by placing a moratorium on pipeline construction in the shallow water habitat between April and September	No
Operation	Decreased utility of feeding habitat and significant impacts on least tern breeding success if an oil spill reaches foraging habitat around the time of, or during, the April-to-September breeding season	34, 35	Reduce probability of a spill reaching foraging habitat	Yes
	Long-term marine biological impacts from an oil spill event in the harbor	34, 35, 47	Help minimize magnitude of spill events	Yes

Table S-1 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
System Safety and Reliability				
Construction and operation	Potential for fire/explosion and system shutdown	37 to 42	Reduce probability of fire/explosion and prevent system shutdown	Yes
	Tanker collisions/accidents	18, 19	Reduce potential for tanker collisions and other accidents	Yes
Oil Spill Potential				
Construction	None identified	-	-	-
Operation	Oil spill probabilities would vary, based on volume of oil lost and the age of pipeline. Probability of 0.03 spill/year of 50 barrels or greater for a new pipeline. Probability would increase to 0.93 spill/year after 30 years of operation. Probability of 7 spills/100 barrels or more at POLA tank farm and 11 spills/100 barrels or more at Midland tank farm over 30-year period.	43 to 47[e]	Reduce probability of oil spill and consequences should one occur	Yes

Note: When no significant impact is identified, no data is reported (indicated by a dash).
[a]Only planned mitigation measures are used in this table. Planned and available mitigation measures are discussed in subsection 4.7.
[b]NA = not applicable/none available.
[c]Project description includes requirements for frequent inspection of the pipeline route.
[d]Use of block and check valves would minimize quantity of oil spilled. The Oil Spill Contingency Plan would aid in rapid cleanup of areas and streams contaminated by oil spill.
[e]Oil spills could cause significant impacts to various resources, depending on the size and location of the spill. Specific mitigation measures for oil spill impacts to sensitive resources are also contained under those resources.
Source: ES, 1985.

Table S-2 - Difference in Significant Impacts Using Coachella Valley Alternative from Pactex Proposal

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Air Quality				
Construction and operation	ND[b]	-	-	-
Geologic and Seismic Setting				
Construction and operation	ND	-	-	-
Soils				
Construction and operation	ND	-	-	-
Surface Water				
Construction and operation	ND	-	-	-
Groundwater				
Construction and operation	ND	-	-	-
Freshwater Biology				
Construction and operation	ND	-	-	-

Table S-2 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Terrestrial Biology				
Construction	Loss of Coachella Valley fringe-toed lizards	17	Minimize numbers lost or injured	Yes
	Loss of sensitive plants (see subsections 4.2.7.G and 4.3.7)	14	Reduce loss of sensitive plant species	No
Operation	None identified	-	-	-
Socioeconomics				
Construction and operation	None identified	-	-	-
Land Use and Recreation				
Construction and operation	None identified	-	-	-
Transportation, Energy, Utilities, and Public Services				
Construction and operation	None indentified	-	-	-
Cultural Resources				
Construction and operation	ND	-	-	-

Table S-2 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Paleontology				
Construction	Potential loss of fossils by construction and unauthorized collection in areas of moderately important exposure; 5 fewer fossil localities and 3 fewer miles of highly important fossiliferous exposure impacted than in Pactex proposal	NA	NA	Yes
Operation	Increased potential for unauthorized collection in fossiliferous areas; 5 fewer fossil localities and 3 fewer miles of highly important fossiliferous exposure impacted than in Pactex proposal	NA	NA	Yes
Visual Resources				
Construction and operation	None identified	-	-	-
Noise				
Construction and operation	ND	-	-	-
Oceanography and Marine Biology				
Construction and operation	NA	-	-	-

Table S-2 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
System Safety and Reliability				
Construction and operation	ND	-	-	-
Oil Spill Potential				
Construction and operation	ND	-	-	-

Note: When no significant impact is identified, no data is reported (indicated by a dash).
[a]Only planned mitigation measures are used in this table. Planned and available mitigation measures are discussed in subsection 4.7.
[b]ND = no difference in significant impacts from proposed project as shown in Table S-1.
[c]NA = not applicable/none available.
Source: ES, 1985.

Table S-3 - Difference in Significant Impacts Between Port Alternative 1 (70-ft-dredge depth and 96-acre landfill) and Pactex Proposal

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Air Quality				
Construction and operation	ND[b]	-	-	-
Geologic and Seismic Setting				
Construction and operation	ND	-	-	-
Soils				
Construction and operation	ND	-	-	-
Surface Water	ND	-	-	-
Construction and operation				
Groundwater				
Construction and operation	ND	-	-	-
Freshwater Biology				
Construction and operation	ND	-	-	-

Table S-3 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Terrestrial Biology				
Construction and operation	ND	-	-	-
Socioeconomics				
Construction and operation	None identified	-	-	-
Land Use and Recreation				
Construction and operation	ND	-	-	-
Transportation, Energy, Utilities, and Public Services				
Construction and operation	None identified	-	-	-
Cultural Resources				
Construction and operation	ND	-	-	-
Paleontology				
Construction	Potential loss of moderately important strata by dredging and filling; 25 fewer acres impacted by filling than in Pactex proposal	NA[c]	NA	Yes
Operation	ND	-	-	-

Table S-3 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Visual Resources				
Construction and operation	None identified	-	-	-
Noise				
Construction and operation	ND	-	-	-
Oceanography and Marine Biology				
Construction	Loss of 183 acres of deep soft bottom habitat from fill and dike (net difference of 25 acres) before consideration of marine habitat gained from other island components	36	Reduce impacts on marine resources and habitat	Yes (see Appendix I.6)
Operation	ND	-	-	-
System Safety and Reliability				
Construction and operation	Reduced setback of tanks from berth	NA	Greater probability of fire/explosion impacts	Yes

Table S-3 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Oil Spill Potential				
Construction and operation	ND	-	-	-

Note: When no significant impact is identified, no data is reported (indicated by a dash).
[a]Only planned mitigation measures are used in this table. Planned and available mitigation measures are discussed in subsection 4.7.
[b]ND = no difference in significant impacts for the proposed project as shown in Table S-1.
[c]NA = not applicable/none available.
Source: ES, 1985.

Table S-4 - Difference in Significant Impacts Between Port Alternative 2 (fully contained 170-acre landfill) and Pactex Proposal

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Air Quality				
Construction	Exhaust from heavy-duty construction equipment will occur over an additional 12- to 14-month period in POLA	1	Reduce NO_x and SO_2	No
	Fugitive dust from disturbed areas will occur over an additional 12- to 14-month period in POLA	7	Reduce by approximately 50%	No
Operation	ND[b]	-	-	-
Geologic and Seismic Setting				
Construction	None identified	-	-	-
Operation	Reduced risk of landslide- and/or liquefaction-induced ground failure of fully contained landfill island in POLA	NA[c]	NA	Yes
Soils				
Construction and operation	ND	-	-	-
Surface Water				
Construction and operation	ND	-	-	-

Table S-4 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
Groundwater				
Construction and operation	ND	-	-	-
Freshwater Biology				
Construction and operation	ND	-	-	-
Terrestrial Biology				
Construction and operation	ND	-	-	-
Socioeconomics				
Construction and operation	None identified	-	-	-
Land Use and Recreation				
Construction and operation	ND	-	-	-
Transportation, Energy, Utilities, and Public Services				
Construction and operation	None identified	-	-	-
Cultural Resources				
Construction	Damage or loss of an additional known site	23	Avoid or alleviate adverse impacts to cultural resources	No
Operation	ND	-	-	-

Table S-4 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (Subsection 4.7)[a]	Effectiveness	Impact Still Significant
Paleontology				
Construction	Potential loss of moderately important strata by dredging and filling	NA	NA	Yes
Operation	ND	-	-	-
Visual Resources				
Construction and operation	None identified	-	-	-
Noise				
Construction and operation	ND	-	-	-
Oceanography and Marine Biology				
Construction	Generate turbidity and associated water quality impacts on DO, transparency, and settleable solids over an additional 12- to 14-month period	26 to 29	Minimize potential for significant water quality impacts through monitoring, regulatory standards, dredge methods, and turbidity containment	No
Operation	ND	-	-	-

Table S-4 (Contd)

Discipline	Significant Impact	Planned Mitigation Measure (subsection 4.7)[a]	Effectiveness	Impact Still Significant
System Safety and Reliability				
Construction and operation	ND	-	-	-
Oil Spill Potential and Effects				
Construction and operation	ND	-	-	-

Note: When no significant impact is identified, no data is reported (indicated by a dash).
[a]Only planned mitigation measures are used in this table. Planned and available mitigation measures are discussed in subsection 4.7.
[b]ND = no difference in significant impacts for the proposed project as shown in Table S-1.
[c]NA = not applicable/none available.
Source: ES, 1985.

SECTION 1 INTRODUCTION

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INTRODUCTION

The objective of the Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Pacific Texas Pipeline Co.'s (Pactex) proposed project is to provide decisionmakers and the general public with a comprehensive and objective analysis of the environmental impact of the proposed project in a document that is clearly written and complies with both the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA).

1.1 BACKGROUND OF THE PROJECT

The Los Angeles Harbor Department (LAHD) and the Bureau of Land Management (BLM) are preparing a joint state and Federal EIR/EIS for a proposed Pactex project to construct and operate a crude oil transportation system between Los Angeles, California, and Midland, Texas. The proposed pipeline and related berthing/terminal facilities would receive crude oil from Alaska, California, and Pacific rim countries and transport up to 900,000 barrels per day (bpd) of crude oil to Midland, Texas.

An Application for a Development Permit was filed with LAHD on November 19, 1984. An Application for an Oil Pipeline Right-of-Way (ROW) was filed with the BLM on May 16, 1983. Supplement 1 to the ROW application was filed with the BLM on September 29, 1983. The LAHD and Pactex applied to the U.S. Army Corps of Engineers (COE) for a Section 10/404 permit on April 15, 1985. These applications triggered the preparation of an EIR/EIS. LAHD and BLM are the co-lead agencies directing the EIR/EIS preparation to fulfill the requirements of CEQA and NEPA, respectively. Cooperating agencies include the U.S. Fish and Wildlife Service (FWS), Region V Laguna Niguel, and the COE, Los Angeles District.

Pactex has proposed to operate its pipeline as a common carrier, as authorized by Interstate Commerce Commission Provisions (19 USCA Section 10501). The proposed Pactex pipeline would follow the same general route as a previously proposed project by Standard Oil Company of Ohio (SOHIO). Environmental review activities relating to the SOHIO project included the publication of a Final EIR by the Port of Long Beach and the California Public Utilities Commission (Port of Long Beach, 1977) and a Final EIS by the BLM (BLM, 1976). The major differences between the proposed project by Pactex and the previous project proposed by SOHIO are:

(1) Capacity - The pipeline capacity proposed by SOHIO for the initial phase of development was 500,000 bpd of crude oil. The proposed throughput capacity for the Pactex project would be 900,000 bpd.

(2) Berthing and Terminal Facilities - The Pactex berthing and terminal facilities would be located on a landfill island in the outer POLA harbor area near the middle breakwater. Pactex would install innovative technology to control emissions from tankers while offloading oil. SOHIO proposed facilities in the Port of Long Beach and did not propose a control system for tanker stack emissions.

(3) Pump Stations - The locations of some of the Pactex pump stations would be different from SOHIO's locations. The total number of Pactex pump stations would be significantly reduced from SOHIO's proposal.

(4) Pipeline - The proposed Pactex project would lay a totally new 42-in.-diameter pipeline. The SOHIO proposal was to convert an existing natural gas pipeline to a crude oil pipeline for a large part of its route.

The proposed Pactex pipeline would follow the same corridors currently being used for pipelines by the Southern California Gas Company, the El Paso Natural Gas Company, and portions of the proposed ROW of the All-American Pipeline Company. In January 1985, a Final EIR/EIS (FEIR/EIS) was published for the proposed Celeron/All-American and Getty pipeline projects (BLM, 1984a). These pipeline projects would transport outer continental shelf (OCS) and other California-produced crude oils in a heated pipeline system from the Santa Barbara and Santa Maria basins to McCamey, Texas.

Pactex's proposed pipeline route would parallel an existing El Paso Natural Gas Company pipeline (within 100 ft of the centerline of the ROW). It would also parallel the Celeron/All-American pipeline route for approximately 650 miles from Blythe, California, to Pine Springs, Texas. In accordance with the Council on Environmental Quality (CEQ) regulations for reduction of unnecessary paperwork in compliance with NEPA (40 CFR 1506.3), portions of the Final EIR/EIS for the All-American pipeline project are incorporated by reference for this 650-mile section of the Pactex pipeline that would have the same alignment as the All-American route. Portions of this document and other related documents are summarized herein for the reader's convenience (Section 5 lists the depository libraries where these documents are available).

A berthing facility and terminal would be constructed in the outer harbor of POLA. The proposed landfill island is consistent with the draft 2020 Plan, a joint planning effort of the Ports of Los Angeles and Long Beach and the COE. The draft EIR/EIS for the 2020 Plan is available at LAHD. Two fixed-tanker berths would be constructed in the harbor. The berths would be located adjacent to a new landfill to be located in the outer harbor area on the seaward side of Terminal Island and inside the breakwater. Construction of the port facilities would start in early 1986. Pipeline construction would start 3 to 4 months later. Operation would begin approximately July 1987, or 18 months after construction startup.

1.2 GENERAL PROJECT LOCATION

The proposed Pactex project would carry crude oil from a berthing facility in the outer POLA harbor at Los Angeles, California, to a terminal facility at Midland, Texas. Oil offloaded at POLA would be transported to the terminal storage facility located on the manmade landfill island. Crude oil would be transported from the terminal in California through a single, buried 42-in.-diameter pipeline to Midland, a distance of approximately 1,030 miles (see Figure 1.2-1). The proposed pipeline would cross lands administered by LAHD, BLM, U.S. Forest Service, U.S. Department of Defense (DOD), and various state agencies, as well as privately held lands.

The pipeline route would run north-northeast from the landfill island approximately 20 miles, then east generally parallel to the route of Interstate 10 (I-10), running south of San Bernardino, through the Banning Pass (San Gorgonio Pass), north of Palm Springs, and crossing the Colorado River at Blythe, California. The route would then follow I-10 into western Arizona, run north of the Kofa National Wildlife Refuge (All-American Pipeline EIR/EIS Brenda Alternative), leave I-10 to cross the Gila River near the Gillespie Dam, pass south of Phoenix and north of Tucson, cross I-10 near Casa Grande, and run generally southeastward to again cross I-10 near Willcox, Arizona. Turning east, the route would enter New Mexico near Lordsburg and Deming and then cross the Rio Grande River midway between El Paso and Las Cruces. The route would enter Texas, pass south of Guadalupe Mountain National Park, and then reenter New Mexico, passing south of Carlsbad. Reentering Texas, the pipeline route would run generally east to end at a terminal facility at Midland, Texas.

The Midland terminal would deliver incoming crude oil to existing pipelines for transportation to the midcontinent, the east coast, and the gulf coast regions. Table 1.2-1 presents an indication of the crude oil pipeline systems and capacities in the Midland area. Most pipeline companies do not identify their volumes on specific parts of their systems. The capacities listed in Table 1.2-1 are based on pumping pressures equal to 10 and 15 $lb/in.^2$. It is likely that higher flows could be accommodated without major investments.

In the Midland area, four refineries have crude oil requirements of 160,900 bpd. These refineries presently use local crude oils. The decline in oil production in the Permian Basin over the years has resulted in increasing surplus pipeline capacity.

1.3 INTENDED USE AND AUTHORIZING ACTIONS

In accordance with the NEPA/CEQA guidelines, authorization to construct and operate the proposed Pactex pipeline project requires the completion of a EIR/EIS assessing the potential impacts of the proposed project. Federal ROW grants would be issued by the BLM. At the state level, the California Coastal Commission is responsible for evaluating Pactex's harbor development plan within the context of the California Coastal Act. The LAHD would issue a lease and construction permit for the berthing and terminal facilities. The California State Lands Commission (SLC) would act on ROW permits for lands along the Colorado River under its jurisdiction. Other public agencies will

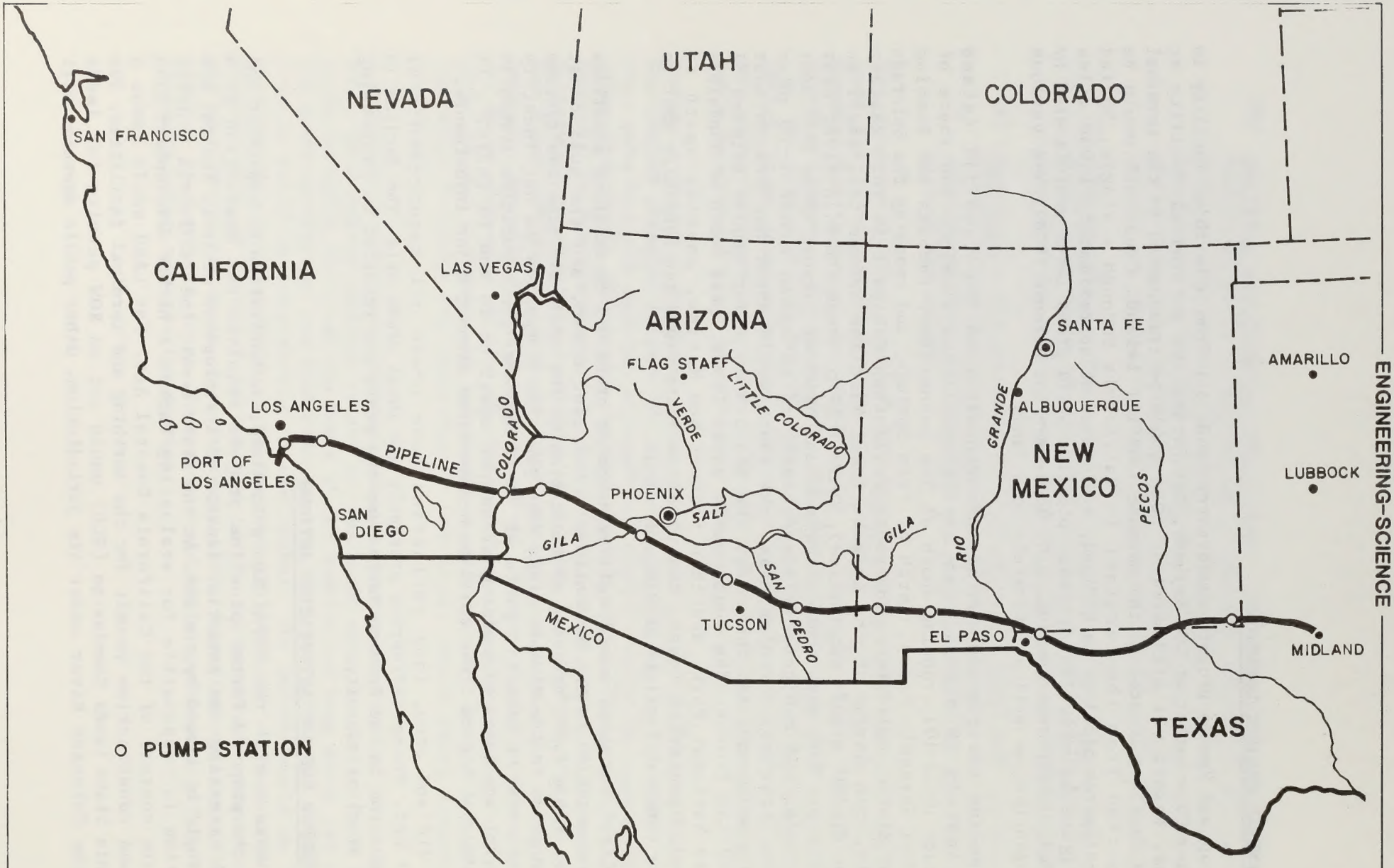


Figure 1.2-1 - Regional Map of States Crossed by Proposed Pactex Pipeline
(Pactex, 1985)

ENGINEERING-SCIENCE

Table 1.2-1 - Existing Crude Oil Pipelines in the Vicinity of Midland, Texas

System Name	Destination or Pipeline Junction	Diameter (in.)	Approximate Capacity[a] (1,000 bpd) 10 lb/in.^{2}	15 lb/in.^{2}
Amdel	Port Arthur, TX	10	26.4	33.0
American Petrofina	Corpus Christi, TX	10	26.4	33.0
Amoco	Cushing, OK	16/16	160.0	200.8
Basin	Cushing, OK	22	197.0	258.0
Chevron	El Paso, TX	20	151.0	187.5
Exxon	Corpus Christi, TX	12	42.7	53.7
Exxon	Houston, TX	18	125.0	140.0
Mesa/W. Texas Gulf	Port Arthur, TX	24/26	312.0	395.0
Mobil	Corsicana, TX	12/16	166.4	207.8
Phillips	Borger, TX	12	42.7	53.7
Rancho	Houston, TX	24	250.0	316.0
Shell	Cushing, OK	10	26.4	33.0
Texas-New Mexico	Houston, TX	12	42.7	53.7
Total			1,568.7	1,965.2

[a]Based on no elevation change, whereas all destinations are downhill, except for El Paso and Borger.
Source: Pactex, 1985.

use the FEIR/EIS as the basis for their decisions to issue approvals/permits that they are to grant for this project. State agencies in Arizona, New Mexico, and Texas would act on ROW permits for lands under their respective jurisdictions, although this document is not a prerequisite to ROW grants in those states.

The Federal ROW grants would contain general mitigation measures. After the ROW grant is signed, the applicant would submit a detailed construction and use (CU) plan to the designated Federal authorized officer for review by the agencies. The CU plan would be developed for Federal lands in accordance with applicable Federal regulations [43 CFR Part 2882.2-4(c), Management of Oil and Natural Gas Pipelines and Related Facilities]. At a minimum, the plan would include:

(1) Schedules for construction of the pipeline and all related facilities and estimated construction costs.

(2) Plans for the protection of the environment during construction, operation and maintenance (O&M), and abandonment of the pipeline.

(3) Plans for emergency repair of any rupture during operation, containment of effluent, and restoration of damage.

The BLM would also conduct an environmental and engineering review of the CU plan. Where environmental impacts cannot be mitigated, Pactex may be required to realign the pipeline. Following this review and determination by the authorized officer that preconstruction mitigation measures have been completed, a Notice to Proceed (NTP) would be issued. Only then could construction begin. The Federal authorized officer would inspect and monitor construction to ensure compliance with the NTP and all stipulations.

Subsequent to the requirements covered by this EIR/EIS but prior to the construction of the proposed Pactex pipeline, Pactex would comply with various permit approval requirements. Permits would be obtained from California public agencies within 180 days of the CEQA lead agency decision on the EIR/EIS and the proposed project or within 180 days of accepting a complete permit application, whichever is later. To the extent known, authorizing permit actions and responsible agencies are listed in Table 1.3-1. In addition to these permits, construction of the Pactex pipeline would be subject to the issuance of a lease and construction permit from the LAHD, which is the lead agency for the State of California under CEQA.

California public agencies will be expected to use this document in their decisionmaking processes.

1.4 PURPOSE AND NEED FOR THE PROJECT

This section presents the need for the proposed project primarily as determined by the applicant. Additional details not covered in the following discussion can be found in the application filed by Pactex with LAHD and BLM.

Pactex has proposed to construct and operate a pipeline project that could transport up to 900,000 bpd of heavy crude oil from offloading facilities in the outer POLA harbor to Midland, Texas, where it would enter the transcontinental pipeline system at that location via 14 existing pipelines that serve 75 refineries and the gulf coast demand for petroleum products. The pipeline is likely to transport surplus crude oil from the Alaska North Slope, as well as crude oil from the California production areas and the Pacific rim countries.

A crude oil surplus on the west coast, which is expected to continue, currently exceeds the production capacity of west coast refineries and the west coast demand for petroleum products. Statistically, this growing surplus is located in the Petroleum Administration for Defense District V (PADD V), a Federal oil and gas data collection geographic division that includes Alaska, Arizona, California, Hawaii, Oregon, and Washington. However, in other geographic areas of the United States, the present crude supply is one of

Table 1.3-1 - Authorizing Agency

Agency	Nature of Action	Project Features
FEDERAL		
Department of Agriculture		
Forest Service (Coronado National Forest)	Issue special-use permit for construction.	Construction of access roads, pipeline, and power transmission lines.
	Issue cultural resource use permits for survey and excavation.	All national forest lands.
	Issue fuelwood permits.	Removal of commercial wood products on national forest lands.
Department of the Interior		
Bureau of Indian Affairs	Obtain ROW easements on reservation lands in California and Arizona.	Pipeline and access roads.
	Issue permits to cross canals (San Carlos Irrigation District).	Pipeline and access roads.
Bureau of Land Management	Issue Federal ROW grant.	Pipeline, access roads, power transmission lines, and pump stations.
	Issue temporary-use permits.	Temporary construction activities; staging areas.
	Issue cultural and paleontological resource-use permits for survey and excavation.	BLM-managed Federal land.
	Issue noncompetitive mineral materials sales contract.	Aggregate for pump station construction and access road construction.
Bureau of Reclamation	Issue special land-use license or easement.	Pipeline and access roads crossing Central Arizona Project irrigation canals.
	Issue special land-use permit.	Pipeline, access roads, etc.
Fish and Wildlife Service	Issue Biological Opinion on threatened or endangered species of fish, wildlife, or plants as part of Section 7, Endangered Species Act, for all Federal actions.	All project features.

Table 1.3-1 (Contd)

Agency	Nature of Action	Project Features
FEDERAL (Contd)		
Fish and Wildlife Service (Contd)	Implement provisions of Fish and Wildlife Coordination Act.	Impacts to marine, aquatic, and terrestrial resources.
Department of Defense		
U.S. Army Corps of Engineers	Evaluate nationwide and individual permit applications (Section 404) for placement of dredged or fill material in waters of the United States or adjacent wetlands.	Placement of dredge spoils for landfill island.
	Evaluate permit applications to cross navigable waters: Los Angeles Flood Control District, Los Angeles River, Rio Hondo Percolation Basin, San Gabriel River, Whittier Narrows, San Jose Creek, Santa Ana River, San Gorgonio River, Whitewater River, Colorado River, Gila River, San Pedro River, San Simon River, Dry Lake, Rio Grande, Pecos River, and San Antonio Channel.	Pipeline.
	Issue permit(s) (Section 10) for structures or work in or affecting navigable waters of the United States.	Water diversion facilities and construction resulting in alterations to water courses. POLA berthing facilities.
U.S. Army	Issue easement to cross department lands; individual base commanders have final approval.	Pipeline across Fort Bliss Military Installation.
	Issue cultural use permits for survey and excavation.	
Federal Communications Commission	Issue license to operate industrial radio service.	Communications.
Department of Transportation		
U.S. Coast Guard	Issue Operations Manual.	Marine terminal and berthing facilities in POLA.
	Issue permit for aerial crossings.	Temporary and permanent bridges over navigable waterways.
Federal Highway Administration	Issue permit(s) to cross Federal-aid highways.	Pipeline and access roads.
Environmental Protection Agency	Issue permit(s) to construct and operate surge tanks, storage tanks, transfer piping, and pumping equipment.	Air emission permits and oil pollution control requirements for pump stations and tank storage facilities.

Table 1.3-1 (Contd)

Agency	Nature of Action	Project Features
FEDERAL (Contd)		
Environmental Protection Agency (Contd)	Issue NPDES permit(s) to discharge wastewater (California and Texas have primacy).	Any discharge of hydrostatic test water and discharge from tank storage facilities.
	Approve oil spill contingency plans and spill prevention, containment, and countermeasure plans.	Pipeline, terminal, and berthing facilities.
International Boundary and Water Commission	Issue license to cross leveed floodway.	Pipeline construction across Rio Grande in New Mexico.
Federal Energy Regulatory Commission	Approve operations and tariffs.	Pipeline operations.
Department of Commerce		
Federal Maritime Commission	Approve agreement between Pactex and LAHD in accordance with Shipping Act of 1984.	Marine terminal and berthing facilities in POLA.
National Marine Fisheries Service	Issue Biological Opinion on threatened or endangered marine mammals as part of Section 7, Endangered Species Act, for all Federal actions. Implement provisions of Fish and Wildlife Coordination Act.	Pipeline.
STATES		
California		
Coastal Commission	Issue Development Permit (for portions of project within coastal zone, but outside port), Federal Consistency Certification, Port Master Plan Amendment, Development Permit (for port portions, if not issued by Port), and port development permit appeals.	Activities within the coastal zone for development permit and/or Port Master Plan amendment.
State Lands Commission	Issue leases to cross state land.	Pipeline crossing state lands.
Department of Transportation	Issue permit(s) to cross the following highways: State 7, State 1, U.S. 405, State 7, State 91, State 42, U.S. 5, State 72, State 19, State 60, U.S. 605, State 39, State 60, State 71, State 83, State 31, State 60, U.S. 15E, State 60, State 79, I-10, State 111, U.S. 60/70, U.S. 60, U.S. 60, U.S. 60/70, U.S. 60/70, and U.S. 78.	Pipeline, access roads, and transmission lines.

Table 1.3-1 (Contd)

Agency	Nature of Action	Project Features
STATES (Contd)		
California (Contd)		
Department of Fish and Game	Issue stream alteration agreement.	Possible alterations of stream course.
	Issue Biological Opinion on state rare and endangered species pursuant to Federal and state endangered species acts. Consultation role under FWCA.	All project features.
California Water Quality Control Board, Los Angeles Region	Issue permit to discharge hydrostatic test water.	Pipeline and storage tanks.
	Issue permit to discharge wastewater (NPDES).	Any wasterwater discharge from marine terminal storage tanks and pump stations, including runoff from retention ponds. NPDES required for harbor dredging and dewatering trenches.
California Water Quality Control Board, Santa Ana Region	Issue permit to discharge wastewater (NPDES).	Dewatering trenches.
California Water Quality Control Board, Colorado River Basin Region	Issue permit to dredge Colorado River. Issue permit to discharge wastewater (NPDES).	Pipeline. Dewatering trenches.
Southern California Air Pollution Control Districts and South Coast Air Quality Management District	Issue permit to operate pump stations, storage tanks, and terminal facilities.	Air emissions from storage tanks and tankers.
State Water Resources Control Board	Issue Certificate of Conformance for Colorado River and East Branch Aqueduct.	Pipeline.
California Division of Forestry	Issue burning permits.	Various locations (to be determined).
Arizona		
State Lands Commission	Issue easements to cross state lands on Colorado River.	Pipeline and access roads.
Contractor's Office Siting Commission Corporation Commission	Issue state license. Issue Certificate of Compliance. Issue state registration.	Pipeline, access roads, and pump station.

Table 1.3-1 (Contd)

Agency	Nature of Action	Project Features
STATES (Contd)		
Arizona (Contd)		
Department of Transportation	Issue permit(s) to cross the following state highways: U.S. 95, U.S. 80, State 93, State 87/287, State 789, U.S. 80/89, State 77, State 666/86, and I-10.	Pipeline and access roads.
Department of Horticulture	Issue permit to remove commercially valuable cactus.	Pipeline and access roads; where commercial value of cactus exceeds $1,000, it will be auctioned.
Department of Health Services	Issue permit to operate pump stations.	Air emissions from pump stations (and tanks if at pump station).
	Issue permit to discharge hydrotest water.	Pipeline and tanks.
El Paso Natural Gas Company	Issue ROW.	Easements.
New Mexico		
State Lands Office	Issue easements to cross state lands.	Pipeline and access roads.
State Highway Department	Issue permit to cross the following highways: I-10, U.S. 80, State 494, U.S 80/70, U.S. 80/70, State 418, State 331, State 497, State 11, State 413, State 478, State 404, U.S. 285, and State 18.	Pipeline and access roads.
Cultural Properties Review Committee	Issue permit to cross state lands of historical, archaeological, architectural, or scientific value.	Pipeline and access roads.
Environmental Improvement Agency, Air Quality Division	Issue permit to open burn debris.	Pipeline construction.
	Issue permit to construct pump station at Lordsburg, Akela, and Jal.	Pump stations.
Corporation Commission	Issue state registration.	Pactex.
Corporation Commission Pipeline Division	Issue Operations Permit.	Pactex.
	Issue approval to dispose of hydrotest water.	Pipeline and tanks.

Table 1.3-1 (Contd)

Agency	Nature of Action	Project Features
STATES (Contd)		
New Mexico (Contd)		
El Paso Natural Gas Company	Issue ROW.	Pipeline and access roads. New Mexico Environmental Improvement Agency (has control over air and water quality standards).
Texas		
General Land Office	Issue easements to cross state lands.	Pipeline, access roads, and powerlines.
Highway Department (Districts 24 and 6)	Issue permit to cross the following highways: State 3255, State 2637, U.S. 54, U.S. 180/62, U.S. 180/62, U.S. 180/62, State 1108, State 652, State 115, State 181, U.S. 385, State 1788, State 349, and U.S. 80.	Pipeline.
Water Quality Board	Issue permit to discharge wastes to state waters.	Discharge of hydrostatic test water.
Air Control Board	Issue permit to construct and operate pump station at Hueco and at Midland Terminal.	Air emissions from pump stations.
Parks and Wildlife Department	Issue permit to construct streambed.	Pipeline stream crossings.
Railroad Commission	Issue permit to operate a pipeline.	Pipeline.
Secretary of State	Issue state registration.	Pactex.
Water Rights Commission	Issue water-use permit.	Pipeline construction and operation.
Health Department, Midland Terminal	Issue health permit during construction.	Pipeline, access roads, and storage facilities.
COUNTY		
California		
Los Angeles County		
County Road Department	Issue excavation permit to cross county roads (includes Pico Rivera and Paramount).	Pipeline and access roads.

Table 1.3-1 (Contd)

Agency	Nature of Action	Project Features
COUNTY (Contd)		
California (Contd)		
Los Angeles County (Contd)		
Public Facilities and Transportation	Issue franchise permit to cross county roads.	Pipeline and access roads.
Flood Control District	Issue easement to cross county drains.	Pipeline and access roads.
	Issue permit to cross county roads.	Pipeline and access roads.
	Issue permit to remove Joshua trees.	Pipeline and access roads.
San Bernardino County		
Flood Control District, Board of Commissions	Issue easement to cross county drains.	Pipeline and access roads.
Road Department	Issue excavation permit to cross county roads.	Pipeline and access roads.
Board of Supervisors	Issue franchise and excavation permit to encroach county roads.	Pipeline and access roads.
Riverside County		
Planning Commission and Board of Supervisors	Issue public-use permit to construct pipeline.	Pipeline.
Road Department	Issue franchise and excavation permit to cross county roads.	Pipeline and access roads.
Flood Control District, Board of Commissioners	Issue easement to cross county drains.	Pipeline and access roads.
Department of Building and Safety	Issue permit to construct pump station.	Pump station.
Department of Water Quality	Issue easement to cross west Riverside Canal and Riverside Canal Aqueduct.	Pipeline and access roads.
Environmental Planning Office	Obtain county guidelines for CEQA compliance.	Pipeline and access roads.

Table 1.3-1 (Contd)

Agency	Nature of Action	Project Features
COUNTY (Contd)		
Other		
Metropolitan Water District	Issue permit to cross county water canals.	Pipeline and access roads.
Palo Verde Irrigation District	Issue permit to cross water canals.	Pipeline and access roads.
Department of Water Resources East Branch	Issue permit to cross California Aqueduct.	Pipeline and access roads.
Colorado River Water Authority	Issue notice of pipeline route over Colorado River.	Pipeline and access roads.
Arizona		
Maricopa County		
Board of Commissioners	Issue response to letter of intent for pipeline construction across county lands.	Pipeline, access roads, and powerlines.
Road Department	Issue permit to cross county roads.	Pipeline and access roads.
Department of Public Works (or Zoning)	Issue permit to construct and operate pump stations.	Pump stations at Livingston, Gila, and La Posa, AZ.
La Paz County		
Board of Commissioners	Issue response to letter of intent for pipeline construction across county lands.	Pipeline, access roads, and powerlines.
Road Department	Issue permit to cross county roads.	Pipeline and access roads.
Pinal County		
Board of Commissioners	Issue response to letter of intent for pipeline construction across county lands.	Pipeline, access roads, and powerlines.
Road Department	Issue permit to cross county roads.	Pipeline and access roads.
Department of Public Works (or Zoning)	Issue permit to construct and operate pump stations.	Pump station at Coolidge, AZ.

Table 1.3-1 (Contd)

Agency	Nature of Action	Project Features
COUNTY (Contd)		
Arizona (Contd)		
Pima County		
Board of Commissioners	Issue response to letter of intent for pipeline construction across county lands.	Pipeline, access roads, and powerlines.
Road Department	Issue permit to cross county roads.	Pipeline and access roads.
Cochise County		
Board of Commissioners	Issue response to letter of intent for pipeline construction across county lands.	Pipeline, access roads, and powerlines.
Road Department	Issue permit to cross county roads.	Pipeline and access roads.
Department of Public Works (or Zoning)	Issue permit to construct and operate pump station.	Pump station at Redington, AZ.
Floodplain Board	Issue permit to divert, obstruct, or retard watercourse flow.	Pipeline stream crossings.
New Mexico		
Hildalgo County		
Board of Commissioners and Engineering Department	Issue ROW permit to cross county roads.	Pipeline and access roads.
Planning Commission and Department of Building Inspection	Issue special-use permit to construct pipeline.	Pipeline and access roads.
Grant County		
Board of Commissioners and Engineering Department	Issue ROW permit to cross county roads.	Pipeline and access roads.
Planning Commission and Department of Building Inspection	Issue special-use permit to construct pipeline.	Pipeline and access roads.

Table 1.3-1 (Contd)

Agency	Nature of Action	Project Features
COUNTY (Contd)		
New Mexico (Contd)		
Luna County		
Board of Commissioners and Engineering Department	Issue ROW permit to cross county roads.	Pipeline and access roads.
Planning Commission and Department of Building Inspection	Issue special-use permit to construct pipeline.	Pipeline and access roads.
Dona Ana County		
Board of Commissioners and Engineering Department	Issue ROW permit to cross county roads.	Pipeline and access roads.
Planning Commission and Department of Building Inspection	Issue special-use permit to construct pipeline.	Pipeline and access roads.
	Issue easement to cross county lands.	Pipeline and access roads.
Eddy County		
Board of Commissioners and Engineering Department	Issue ROW permit to cross county roads.	Pipeline and access roads.
Planning Commission and Department of Building Inspection	Issue special-use permit to construct pipeline.	Pipeline and access roads.
	Issue easement to cross county lands.	Pipeline and access roads.
Lea County		
Board of Commissioners and Engineering Department	Issue ROW permit to cross county roads.	Pipeline and access roads.
Planning Commission and Department of Building Inspection	Issue special-use permit to construct pipeline.	Pipeline and access roads.

Table 1.3-1 (Contd)

Agency	Nature of Action	Project Features
COUNTY (Contd)		
New Mexico (Contd)		
Other		
Local irrigation districts	Issue permits to cross irrigation canals.	Pipeline and access roads.
Texas		
El Paso County		
County Commissioners Court	Issue permits to cross county roads.	Pipeline and access roads.
	Issue permit to construct and operate pump stations.	Pump stations.
Hudspeth County		
County Commissioners Court	Issue permits to cross county roads.	Pipeline and access roads.
	Issue permit to construct and operate pump stations.	Pump stations.
Culberson County		
County Commissioners Court	Issue permits to cross county roads.	Pipeline and access roads.
	Issue permit to construct and operate pump stations.	Pump stations.
Loving County		
County Commissioners Court	Issue permits to cross county roads.	Pipeline and access roads.
	Issue permit to construct and operate pump stations.	Pump stations.
Winkler County		
County Commissioners Court	Issue permits to cross county roads.	Pipeline and access roads.
	Issue permit to construct and operate pump stations.	Pump stations.

Table 1.3-1 (Contd)

Agency	Nature of Action	Project Features
COUNTY (Contd)		
Texas (Contd)		
Ector County		
County Commissioners Court	Issue permits to cross county roads.	Pipeline and access roads.
	Issue permit to construct and operate pump stations.	Pump stations.
Midland County		
County Commissioners Court	Issue permits to cross county roads.	Pipeline and access roads.
	Issue permit to construct and operate pump stations.	Pump stations.
CITIES		
California		
City of Los Angeles		
Harbor Department	Issue lease for port land.	Marine terminal, pipeline, and pump station.
	Issue engineering construction permit and oversee EIR for port facilities.	Marine terminal, pipeline, and pump station.
City Council	Approve long-term lease.	Marine terminal, pipeline, and pump station.
Planning Department	Issue permit to construct pipeline.	Pipeline, access roads, and pumping and storage facilities.
Department of Building and Safety	Issue permit to construct pipeline project with approval of LAFD.	Pipeline, access roads, and pumping and storage facilities.
Department of Franchise and Public Utility	Issue franchise permit to cross city roads.	Pipeline and access roads.

The following cities also issue various permits: Banning, Beaumont, Blythe, Carson, Chino, Coachella, Colton, Compton, Downey, Fontana, Indio, Industry, Long Beach, Loma Linda, Montebello, Ontario, Paramount, Pico Rivera, Pomona, Redlands, Rialto, San Bernardino, and South Gate.

Source: Pactex 1985; ES, 1985.

deficiency rather than surplus. Currently this deficiency is alleviated by crude oil transfer using:

(1) Ships traveling from the U.S. west coast to Panama
(2) Pipeline across Panama
(3) Ships traveling from Panama to the gulf coast ports.

Pactex believes that this situation would be more efficiently and more securely alleviated by the transfer of the west coast crude oil surplus to areas of deficiency via a pipeline system located entirely within the contiguous United States.

As a common carrier, the proposed system must receive, transport, and deliver crude oil for any shipper meeting the tariff requirements that would be filed with the Federal Energy Regulatory Commission. Pactex plans to establish tariff rules and facilities that would allow shippers to accumulate and batch different types of crude oils through the system within reasonable design and operations limitations. Shippers would be encouraged to combine like crude oils with those of other shippers to more easily meet minimum tender sizes required for the efficient operation of the system. According to Pactex, this batching process would also allow smaller producers or producer groups access to central and eastern U.S. crude oil markets.

As a result of providing an economical west-to-east pipeline, crude oil supply on the west coast can be expected to stabilize under normal market conditions without the variations in surplus supply conditions currently affecting California and other PADD V area petroleum production. Currently, the surplus of crude oil in PADD V is approximately 850,000 bpd, including light sweet imports required for refineries in California. Most of this crude oil is being transported through Panama to the gulf and east coasts of the United States and to refineries in the Caribbean. By the late 1980s, Pactex expects crude oil production in PADD V to increase an additional 600,000 bpd for a total surplus approaching 1.4 million bpd of crude oil. However, refinery capacity in PADD V could likely remain constant or decrease because of the air quality restrictions. If this happens, decrease in capacity would tend to increase the expected crude oil surplus and, thus, would tend to increase the need for an economical means of transportation to refineries in Texas, Oklahoma, and other midwestern and eastern markets.

Several studies have been performed comparing ship and pipeline transport costs of crude oil from the west coast to the gulf coast on a full-cost basis (Purvin & Gertz, Inc., 1983; ADL, 1984). Although some study parameters varied from case to case (i.e., ship and pipeline capacities, return on investment, type of crude oil transported, etc.) the study results indicated that pipeline transport is competitive with ocean transport, particularly as pipeline capacity increases. Pactex has determined that the cost of pipeline transport from the west coast to the gulf coast would be below that of ocean transport.

The applicant has stated that the proposed pipeline would directly benefit the public (Pactex, 1983a) in the following ways:

(1) Competition between marine and pipeline transport for the crude oil market should result in better service, as well as in lower costs to shippers. Ultimately, these savings could be passed on to the consuming public.

(2) Crude oil market delivery time would be reduced.

(3) More than 3,000 construction jobs would be created by the proposed Pactex project, many of which would exist for the anticipated 18-month construction period. Over 200 permanent O&M jobs would be created for the pipeline.

(4) As a private investment, the Pactex project would generate tax revenues for Federal, state, and local governments.

1.5 ECONOMIC SUPPLY AND DEMAND FOR WEST COAST CRUDE OIL

An analysis of existing economic supply and demand studies was conducted by Engineering-Science to assess the need for the Pactex pipeline. A summary of this analysis is presented here. A detailed analysis is found in Appendix F.

1.5.1 CRUDE OIL SUPPLY

The crude oil supply in PADD V is expected to increase from about 2.9 million bpd in 1984 to 3.15 to 3.75 million bpd in 1990. By the year 2000, supply will range from 2.72 to 3.60 million bpd. Alaskan North Slope production represents more than one-half of the supply.

1.5.2 CRUDE OIL DEMAND

PADD V crude oil demand is presently estimated at about 2.1 million bpd. Demand forecasts for PADD V predict a slight increase over the 1985 to 2000 period. In general, the two demand forecasts used in this study are relatively similar for the 1995 and 2000 periods.

1.5.3 CRUDE OIL SURPLUS

The current PADD V surplus is nearly 850,000 bpd. Projections for 1990 show a range of 1.06 to 1.35 million bpd, while the year 2000 projections range between 0.47 and 1.30 million bpd (Table 1.5-1). The element of greatest uncertainty affecting the post-1990 projections relates to Alaskan production and the potential development of new fields.

Table 1.5-1 - Comparative West Coast Oil Supply and Demand Forecasts
(million bpd)

West Coast Oil	Forecast Year 1985	1990	1995	2000
Supply Forecasts				
Purvin & Gertz, Inc.	2.860	3.150	2.940	2.720
Dames & Moore, Inc.	3.300	3.750	3.700	3.600
Demand Forecasts				
Purvin & Gertz, Inc.	2.070	2.090	2.170	2.250
Dames & Moore, Inc.	2.500	2.400	2.300	2.300
Surplus				
Purvin & Gertz, Inc.	0.790	1.060	0.770	0.470
Dames & Moore, Inc.	0.800	1.350	1.400	1.300

Source: Purvin & Gertz, Inc., 1983; Dames & Moore, Inc., 1983.

SECTION 2
PACTEX PROPOSAL AND ALTERNATIVES

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PACTEX PROPOSAL AND ALTERNATIVES

2.1 INTRODUCTION

This section describes the proposed Pactex project for the transportation of crude oil from POLA via a new berthing facility and a new 42-in.-diameter pipeline to Midland, Texas. Crude oil would be received from the Alaskan North Slope, the California coast, and the Pacific rim. From Midland, the Pactex system would be able to access up to 14 existing pipelines that serve up to 75 existing refineries in the central United States and the gulf coast.

In addition to the Pactex proposal, two landfill configurations, one routing alternative, and five terminal (tank farm) alternatives in the POLA vicinity have been identified. The routing alternative in the Coachella Valley would avoid the proposed Coachella Valley Preserve to protect the fringe-toed lizard, a Federally threatened (state endangered) species. Alternative terminal (tank farm) sites were evaluated both at Carson and at LAHD's properties on the existing 190-acre landfill on Terminal Island, near the Wilmington Liquid Bulk Tank Farm, in the Anchorage Road area, and at a floating terminal facility. The following subsections detail the components of the Pactex proposal and alternatives, as well as the construction, operations and maintenance (O&M), and abandonment phases of the project.

2.2 PACTEX PROPOSAL

Pactex proposes to construct berthing facilities and a 42-in.-diameter buried pipeline with the capacity to transport up to 900,000 bpd of crude oil. Table 2.2-1 summarizes the components and facilities of the proposed project and the Coachella Valley Alternative (a routing alternative described in subsection 2.3.3). Table 2.2-2 summarizes the ownership of lands that would be affected directly by construction and operation of the berthing facilities, pipeline, pumping stations, and terminal facilities.

Additional details on the Pactex proposal are in the ROW application that has been filed with the BLM and in the Application for Development Permit filed with POLA. These documents are available for public review at the BLM California Desert District in Riverside, California, and at LAHD in San Pedro, California.

2.2.1 PROJECT COMPONENTS

The Pactex pipeline system would be composed of the components discussed in the following subsections.

Table 2.2-1 - Summary of Pactex Proposal and Coachella Valley Alternative

Description	Pactex Proposal	Coachella Valley Alternative
Facilities		
Total length (mile)	1,031	1,034
Pump Stations (No.)	11	11
Terminals (No.)	2	2
Block and check valves (No.)	71	71
Land Requirements		
Construction ROW (temporary disturbance) (acre)	19,264	19,301
Operation ROW (permanent disturbance) (acre)	6,755	6,768
Pump stations (acre)	61	61
Terminals (acre)		
POLA	115	115
Midland	100	100

Source: Pactex, 1985; ES, 1985.

Table 2.2-2 - Ownership of Lands Affected by Pactex Proposal

	Federal						State		Private		Other[c]		Total	
	BLM		Forest Service		DOD									
	Miles[a]	Acres[b]	Miles[a]	Acres[b]	Miles[a]	Acres[b]	Miles[a]	Acres[b]	Miles[a]	Acres[b]	Miles[a]	Acres[b]	Miles[a]	Acres[b]
Pipeline														
California	58	379	-	-	-	-	4	26	117	766	49	321	228	1,492
Arizona	111	727	1	6	-	-	120	785	125	818	-	-	357	2,336
New Mexico	137	897	-	-	-	-	56	367	33	216	-	-	226	1,480
Texas	-	-	-	-	5	46	-	-	215	1,394	-	-	220	1,440
Pump Stations														
California	-	6	-	-	-	-	-	-	-	6	-	6	-	18
Arizona	-	6	-	-	-	-	-	6	-	11	-	-	-	23
New Mexico	-	11	-	-	-	-	-	-	-	6	-	-	-	17
Texas	-	-	-	-	-	-	-	-	-	6	-	-	-	6
Terminals														
California	-	-	-	-	-	-	-	-	-	-	-	115	-	115
Texas	-	-	-	-	-	-	-	-	-	100	-	-	-	100
Total	306	2,026	1	6	5	46	180	1,184	490	3,323	49	442	1,031	7,027

[a]Linear miles crossed.
[b]Acres based on a 54-ft permanent ROW (Pactex ROW application to BLM, 1983).
[c]Municipal.
Source: Pactex, 1985; ES, 1985.

A. Berthing Facility

A berthing facility would be constructed in San Pedro Bay at POLA. The berthing would be situated adjacent to a manmade landfill island to be created inside the POLA breakwater as shown in Figure 2.2.1-1. The plan for the landfill island would be consistent with the draft 2020 Plan, a joint planning effort of the Ports of Los Angeles and Long Beach and the COE. The draft 2020 Plan (COE 2020, 1984) identifies the channel and landfill requirements in San Pedro Bay to the year 2020.

1. Landfill Island. The proposed landfill island would be located 2,800 ft north of the middle breakwater and east of Angel's Gate. The south and west sides of this island would correspond with the sides of landfill area LA5, as defined by the COE (COE 2020, 1984a), shown in Figure 2.2.1-1. The entrance channel, outer entrance channel, berthing areas, and turning basin would be dredged to -75 ft MLLW. The 15 million yd^3 of material resulting from this dredging would be used as fill to develop an island with a surface area of 115 acres at +20 ft MLLW. This fill would be contained on the south and east sides by a rock dike approximately 5,300 ft long. The north and west sides of this island would be a sloping beach between elevations -40 ft to +20 ft MLLW on an interim basis. Long- or short-term protection of the beach slope is described in subsections 2.3.2 and 4.2.2.B.1.b.

Two 1,200-ft-long by 230-ft-wide berthing areas would be located on the south side of the island just west of Los Angeles-Long Beach City boundaries with a 10-acre land-based support facility located between the two berths. The supply wharf and oil-containment equipment would also be located on the island and between the berths. The turning basin in the entrance channel would allow the vessels to turn 90 degrees with the aid of tugs and back into the berthing area and moor starboard side to the berth.

The two fixed berths for the tankers would be equipped with permanently installed mechanical offloading arms and two mobile cranes, with accompanying air pollution control devices.

2. Ship Characteristics. The berthing facility has been designed to accommodate tankers corresponding to the maximum tanker size of 225,000 deadweight tons (dwt). The physical characteristics of existing tankers in the west coast oil transportation trade are listed in Table 2.2.1-1. Based on the current size mix of tankers calling at Valdez, Alaska, the 1985 estimate of tankers offloading at the Pactex berthing facility is 408 per year. The maximum size and the average size ship call at POLA is expected to increase because of the increase in channel and berth depths. The increased tanker size could reduce the yearly tanker estimate to 294. Details on the tanker estimates are listed in Table 2.2.1-2.

B. Tanker Emission Control System

The South Coast Air Quality Management District (SCAQMD), as part of the site-permitting process, will require Pactex to mitigate or offset the emissions from the tankers while offloading oil. The tanker emissions during the time period when entering and leaving the harbor are transit emissions.

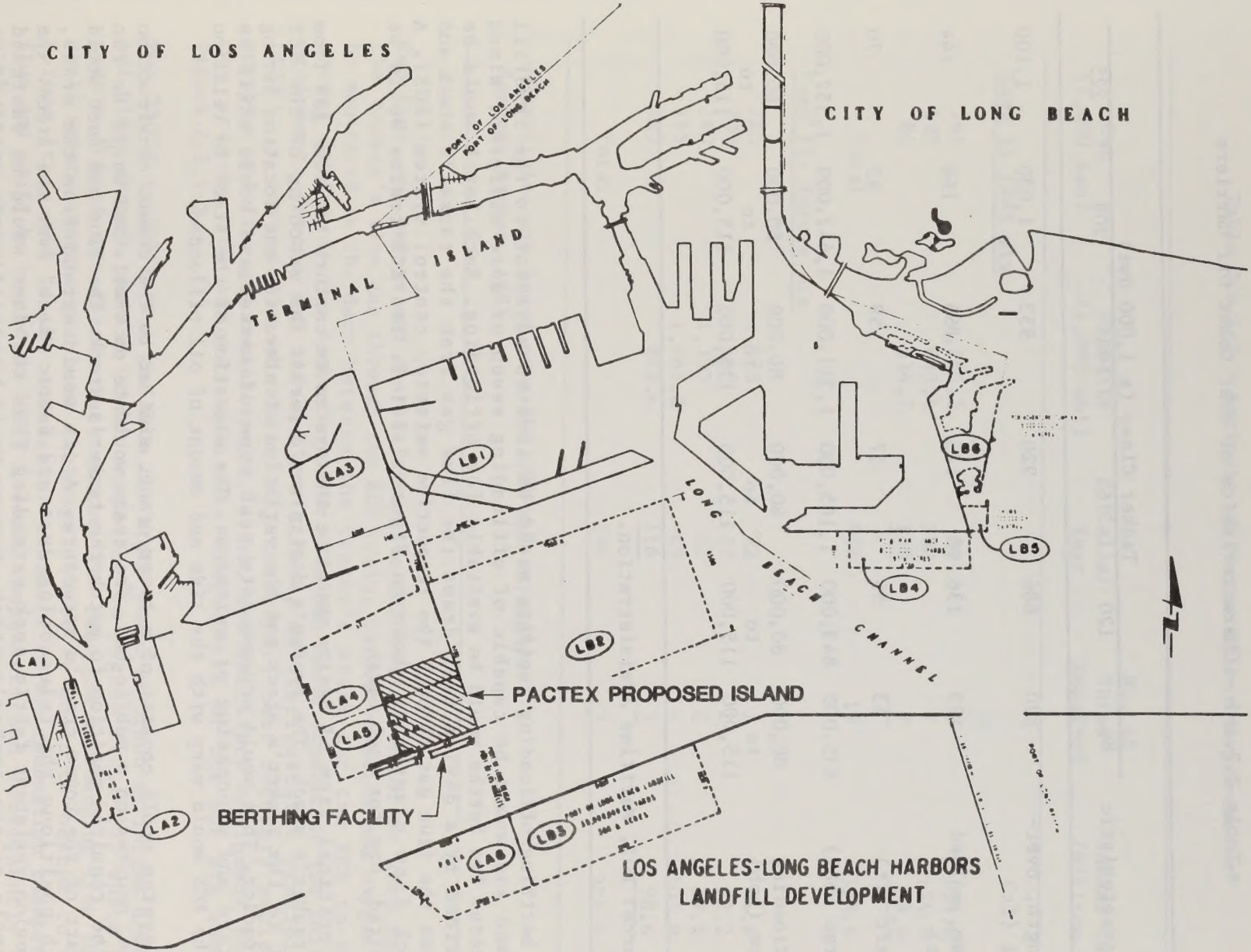


Figure 2.2.1-1 - Location of Proposed Pactex Landfill in Relation to Draft 2020 Plan (not to scale)
(COE, 1984)

Table 2.2.1-1 - Characteristics of West Coast Oil Carriers

Characteristic	Tanker Class (x 1,000 dwt)					
	80	120	165	190	209	225
Length, overall (ft)	820	886	920	953	1,030	1,100
Beam, molded (ft)	125	136	173	166	166	144
Draft (ft)	43	55	57	59	65	70
Cargo (bbl)	535,000	843,000	1,165,000	1,311,000	1,442,000	1,552,000
Offloading rate (bph)	80,000 to 115,000	80,000 to 115,000	80,000 to 115,000	80,000 to 115,000	80,000 to 115,000	80,000 to 115,000

Source: DOT, Maritime Administration.

The berthing/offloading facility would be located adjacent to the landfill island and would be capable of offloading seven or more different sized tankers. Two berths would be available for offloading. Each berth would be serviced by a device that draws the flue gas from the tanker's stack and passes the flue gas through the respective emission control system (ECS). A block flow diagram is shown in Figure 2.2.1-2. Two ECS trains would be required, one for each berth.

The critical item of design would be the system to capture the flue gas from the tanker's stack. The system's design would permit the matching of the ECS duct to the tanker's stack and the variation of elevation and location during offloading. This would accommodate each type of tanker and would maximize capture and processing of emissions. The elevation of the stack in relation to the ECS would vary with the tide and amount of oil offloaded.

The system would consist of a tower crane, similar to the common construction crane, mounted on a mobile bed. The crane would be on wheels and would be run to the required position to match the tanker's stack. The flue gas duct would be part of the tower crane's structure. A jib would extend from the crane, which positions the telescoping duct and fabric "sock" over the stack. The corrosion-resistant fabric sock extending from the duct would be fastened securely to the tanker's stack. Sensors would be placed on the crane's duct to sense the tanker's movement, and the signal would be fed to a computer control center that would automatically position the duct to the tanker.

Table 2.2.1-2 - Estimate of Pactex Tanker Requirements[a]

Dwt (1,000 ton)	Capacity (1,000 bbl)	Calls/ Year	No. of Ships Required	Annual Cargo (million bbl)
Case I: 1985 mix				
165	1,165.2	89	4	103.8
120	843.4	160	7	134.9
80	534.7	159	7	89.9
Total		408	18	328.6
Case II: future mix				
225	1,575	22	1	34.6
209	1,463	22	1	32.2
190	1,330	45	2	59.8
165	1,165.2	89	4	103.8
120	843.4	116	5	98.6
Total		294	13	328.6

[a]Quantities are based on a 900,000-bpd throughput.
Source: Pactex, 1985.

Two fans, one before and another after the ECS train, would be used to draw the tanker's flue gas through the ECS train. Carbon monoxide and oxygen would be monitored in the duct between the tanker's stack and the ECS to ensure proper firing of the tanker's boiler. The ECS would consist of the following equipment: forced and induced draft fans, an electrostatic precipitator (ESP), a combustion chamber, NO_x converter, heat recovery equipment, scrubber and flue gas reheat system, stack, and ancillary equipment such as the propane and ammonia systems. Components of the ECS are shown in Figure 2.2.1-2.

The 250°F to 350°F flue gas from the stack would be drawn by forced draft fan and blown through the ESP (first component in Figure 2.2.1-2), which would remove 70% of the particulate matter. The flue gas discharging from the ESP would enter a gas-to-gas heat exchanger where it would be heated to 450°F before it is fed to the combustion chamber. In the combustion chamber, the flue gas would be heated to 700°F (second component) and subsequently mixed with trace quantities of ammonia before entering the NO_x converter (third component). The ammonia would react with NO_x to form nitrogen (N_2) and water as it passes over the catalyst contained in the converter. A total of

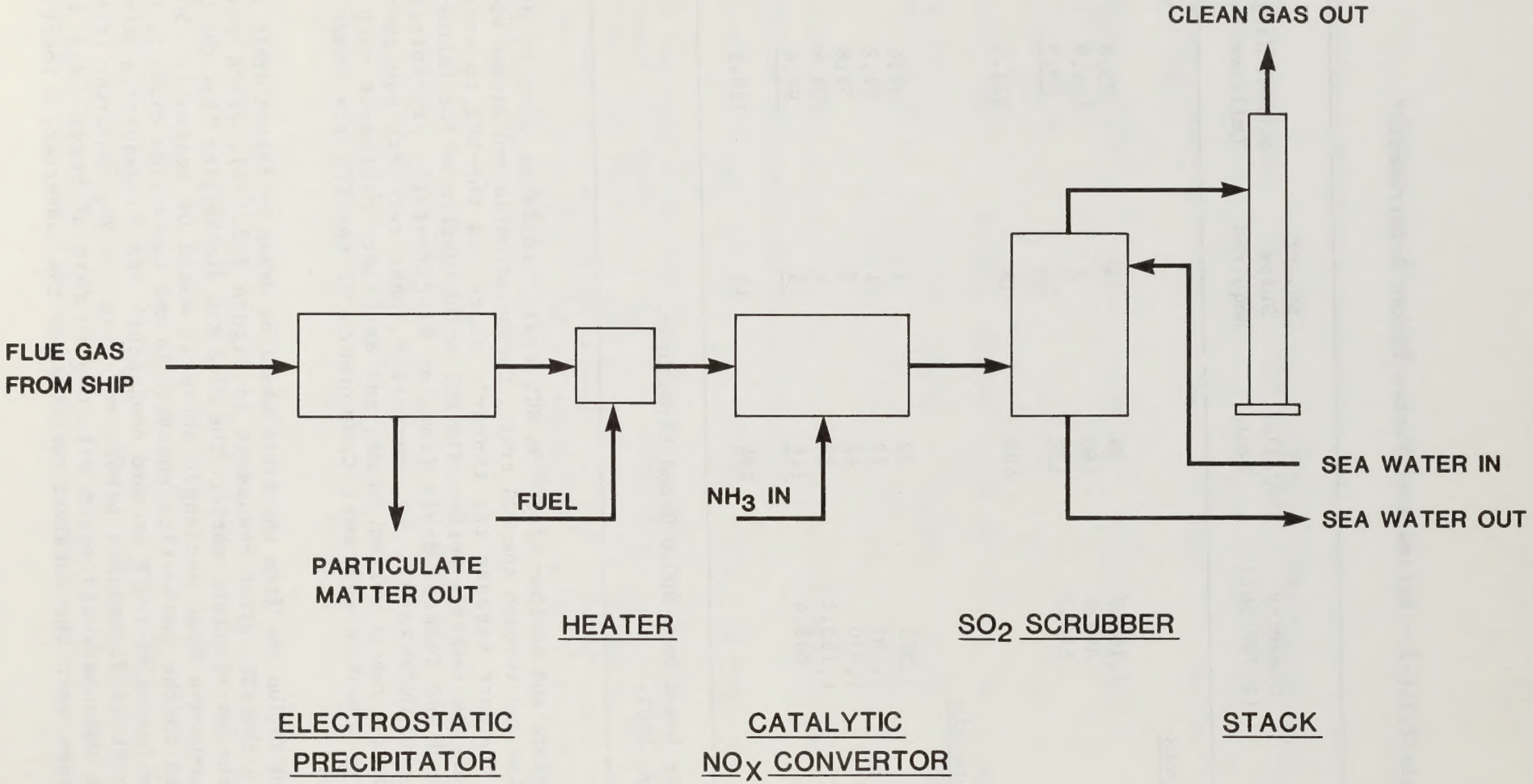


Figure 2.2.1-2 - Tanker Emission Control System (block flow diagram)
(Pactex, 1985)

90% of all of the NO_x would convert to nitrogen. Heat would be recovered from the gas exiting the converter by passing it through three heat exchangers: ECS inlet flue gas, combustion air heater, and scrubber flue gas reheater. The heat recovery system would minimize the use of propane in the combustion chamber.

The flue gas would exit the last heat exchanger (scrubber flue gas reheater) at 350°F just before the SO_2 scrubber (final component of ECS, Figure 2.2.1-2). The flue gas would enter the scrubber where it would pass through three sieve trays flooded with seawater. The seawater would enter at the top of the scrubber, flow across the tray, cascade to the tray below, and finally return to the ocean via a submarine outfall. Seawater is naturally alkaline and would react with 90% of the SO_2 in the flue gas. The quantity of seawater would be so large and the SO_2 so low that the change in chemical composition would be negligible (Table 2.2.1-3). The temperature of the return seawater would increase by approximately 3.3°F.

Table 2.2.1-3 - Emission Control System Intake Water and Effluent Constituents (lb/hr)

Component (lb/hr)	Ash Waste	Seawater In	Seawater Out
Oxygen	-	6,366,242	6,367,922
Hydrogen	-	802,280	802,486
Chlorine	-	141,142	141,142
Sodium	-	77,999	77,999
Magnesium	-	10,028	10,028
Sulfur	-	6,574	6,607
Calcium	-	2,971	2,971
Potassium	-	2,823	2,823
Bromine	-	483	483
Carbon	-	208	208
All other	-	17,769	17,769
Ash (particulate ESP)	6.16	0	13.28
Total (lb/hr)	6.16	7,428,519	7,430,438
Temperature (°F)	250	70	73.3
pH	-	8	7.5

- = not applicable
Source: Pactex, 1985.

Peak water requirements for the ECS are estimated at 14,000 gpm per unit (12 to 20 hours per day). The subsurface intake would be 20 ft below MLLW. Juvenile and adult fish protection for the inlet would be designed to the best available technology using a horizontal intake screen with a maximum intake velocity of 0.5 ft/sec. Cleaning of the intake would be done by physical methods. The subsurface discharge would be through a 20-in. line located at -35 ft MLLW. A schematic of the intake and outfall is shown in Figure 2.2.1-3.

The flue gas leaving the scrubber would be at 100°F. The gas would be reheated to 250°F as it passes through the scrubber reheater before it is drawn through the induced draft fan and is discharged to the atmosphere via an 80-ft stack.

Up to 600 lb/day of flyash (Pactex, 1985) would be collected in the ESP, which would be the only waste generator within the ECS complex. The ash would be stored in the hoppers and periodically transferred and disposed of in accordance with state and local regulatory requirements.

C. Storage Terminal on Island Landfill

Oil would be offloaded from the tankers via ship pumps. It would be transferred through a loading arm, metered, and then distributed via two 48-in. lines to eight floating-roof storage tanks located on the landfill island north of the berthing areas (Figure 2.2.1-4). Oil would then be pumped from the storage tanks at the proposed landfill island via a single 42-in. submarine pipeline to the first pump station located in Wilmington on POLA property. The submarine pipeline would be buried below the harbor bottom. The pipeline would follow the route shown in Figure 2.2.1-5 to the Wilmington pump station. The landfill terminal would have pumping facilities consisting of a 2,000-hp centrifugal pump and a spare pump to move crude oil from the POLA storage terminal to the first pump station.

The specific components of the proposed Pactex facilities at POLA are discussed below.

1. Land-Based Support Facilities. Land-based oil terminal support facilities would be located within a 10-acre parcel (330 ft by 1,300 ft) situated between the two berthing areas (Figure 2.2.1-4). These facilities are summarized below.

a. Metering and Distribution Basin. Above- and underground piping, cathodic protection, valves, a sampling station, air eliminator, metering equipment, and a pig launcher would lie within this area, which would be completely surrounded by an oil-containment dike. The metering and distribution basin meters the amount of offloaded crude oil and distributes it to storage tanks (Figure 2.2.1-6).

b. Control Building. All operations would be monitored and controlled from the observation and control room of this approximate 50-ft by 100-ft two-story building. Interior spaces would house computers, monitoring equipment, alarms, automatic controls, communications equipment, and an

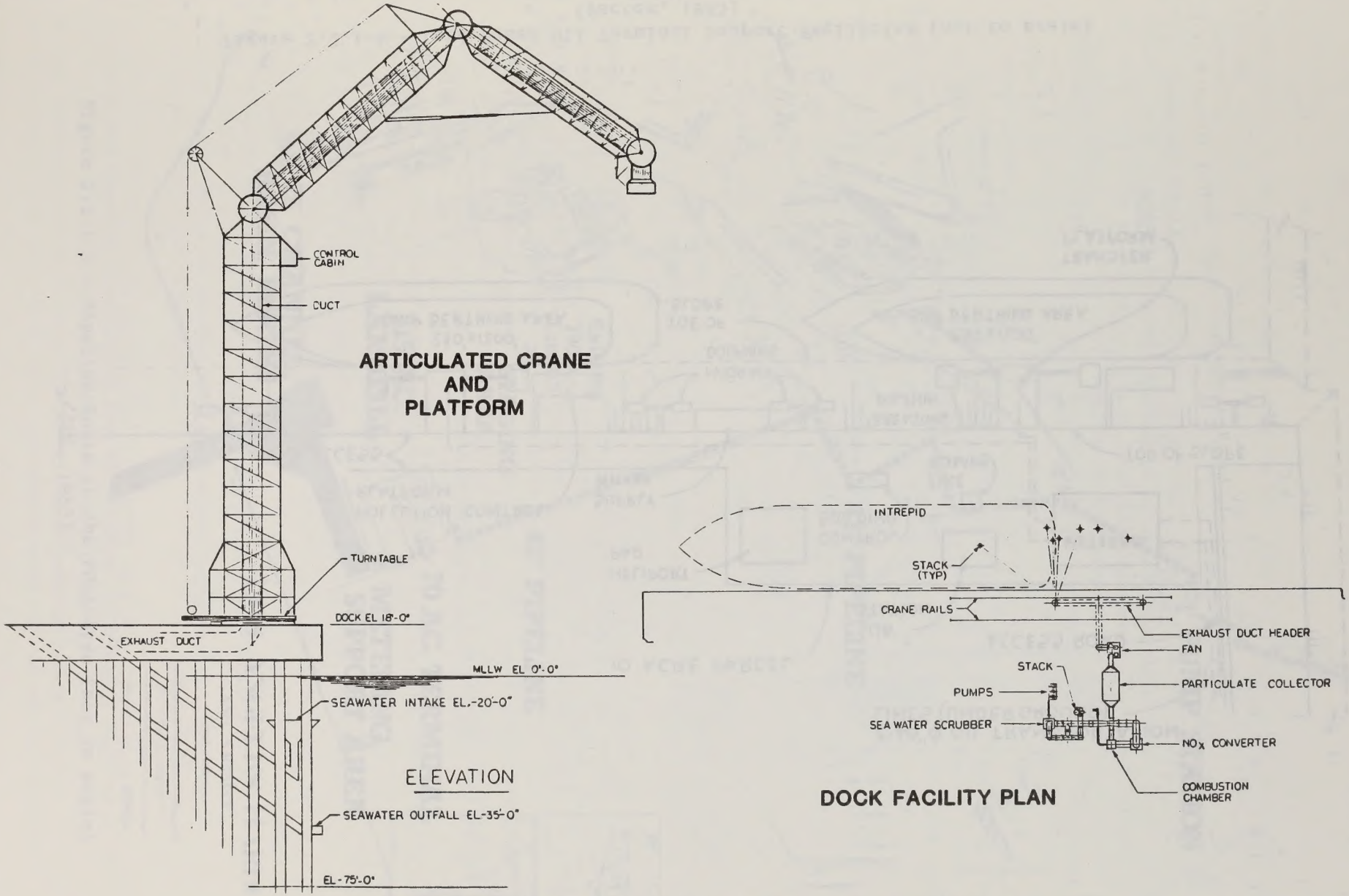


Figure 2.2.1-3 - Intake and Outfall Schematic (not to scale)
(Pactex, 1985)

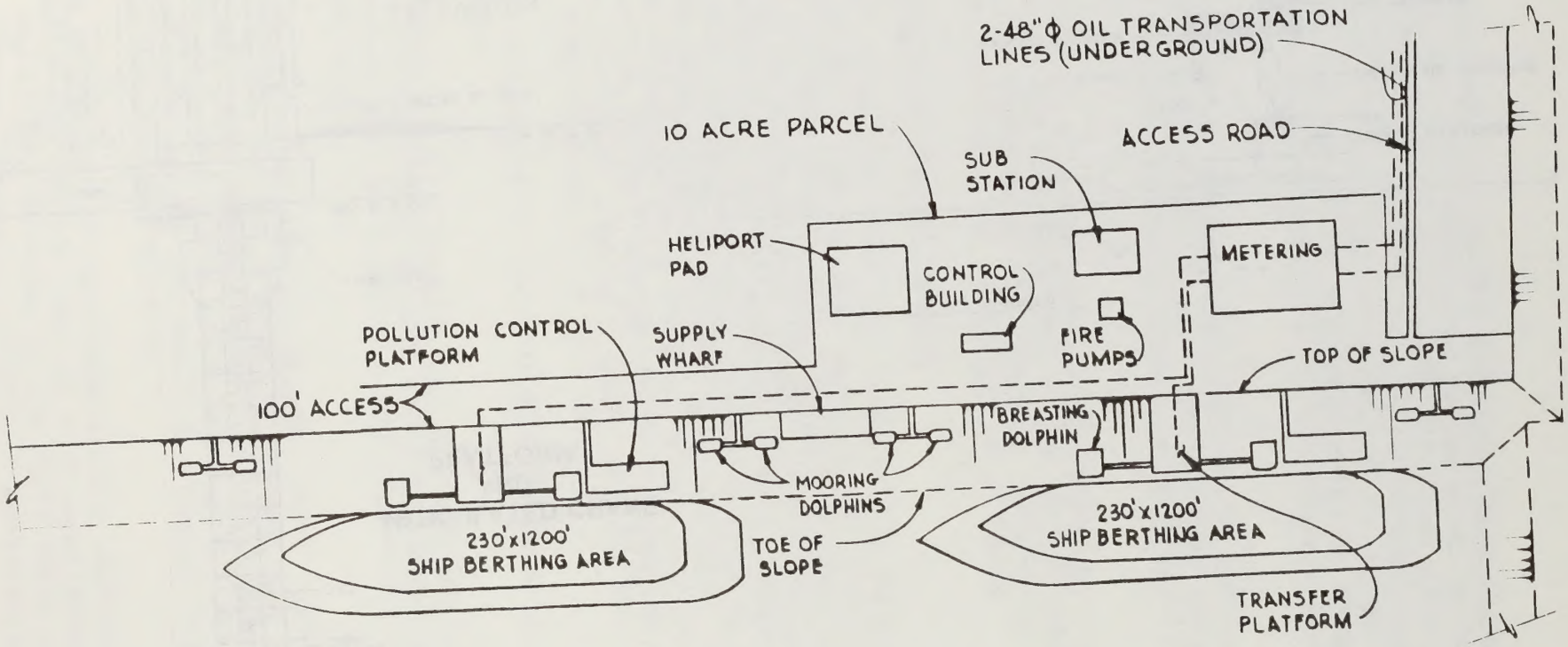


Figure 2.2.1-4 - Land-Based Oil Terminal Support Facilities (not to scale)
(Pactex, 1985)

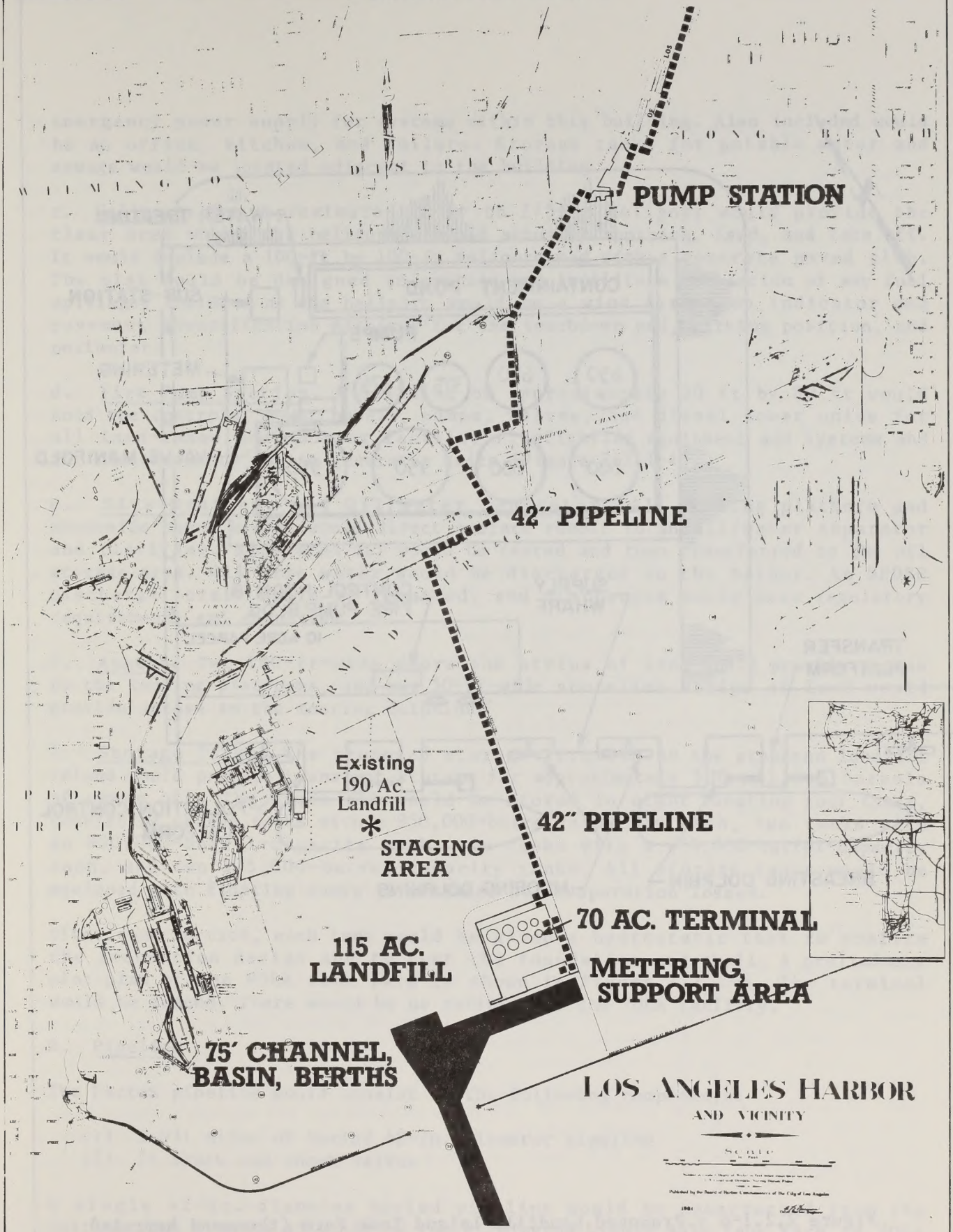


Figure 2.2.1-5 - Pipeline Route in the POLA Area (not to scale)
(ES, 1985)

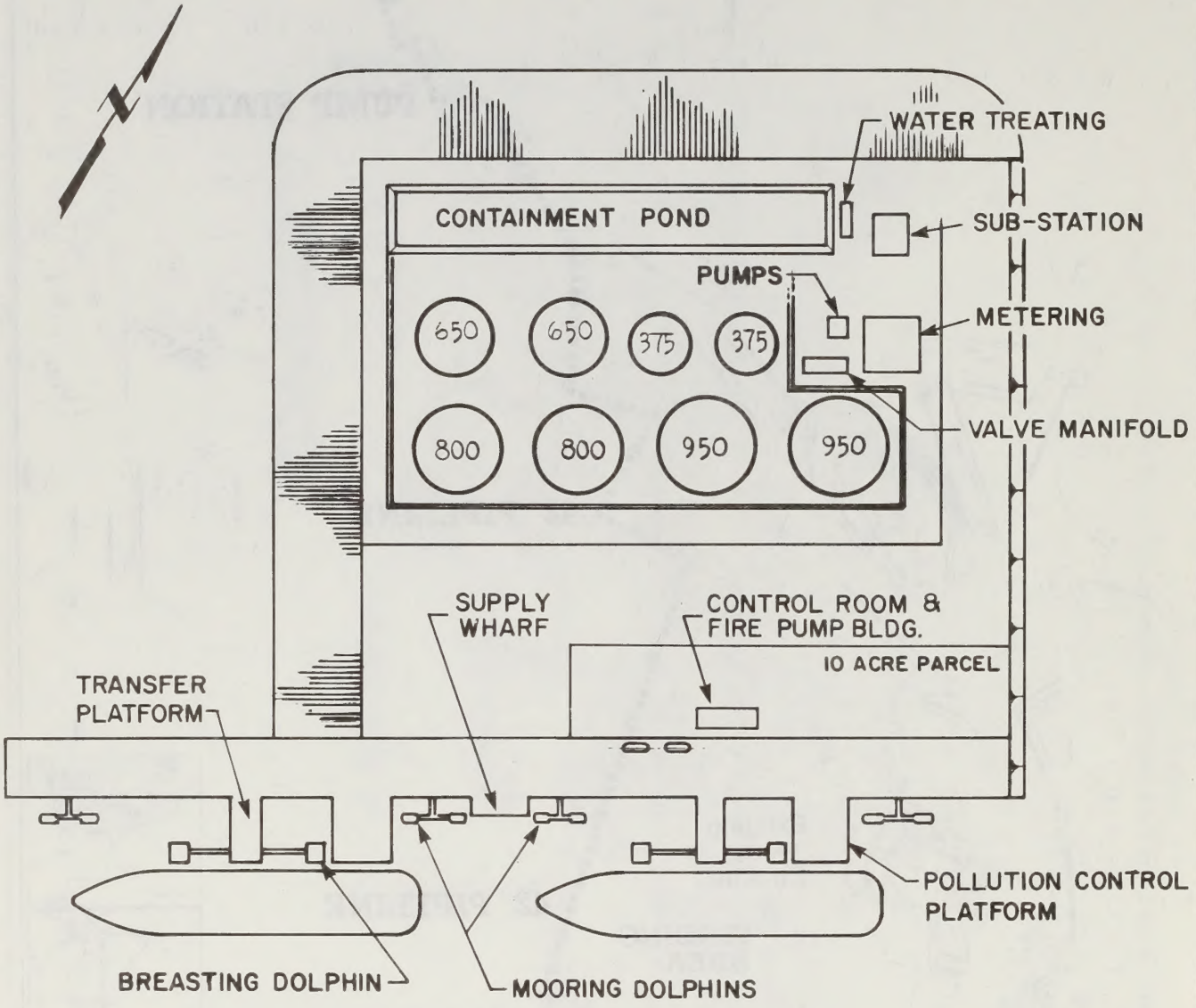


Figure 2.2.1-6 - Proposed Landfill Island Tank Farm (thousand barrels)
(preliminary plot plan, not to scale)
(Pactex, 1985)

emergency power supply for systems within this building. Also included would be an office, kitchen, and toilets. Storage tanks for potable water and sewage would be located adjacent to the building.

c. Heliport. The approximate 120-ft to 175-ft heliport would provide the clear area where the helicopter would actually approach, land, and take off. It would include a 100-ft by 100-ft heliport pad with a concrete paved slab. The slab would be designed to contain and facilitate collection of any fuel spillage. Included at the heliport would be a wind direction indicator and pavement identification markings for the touchdown pad, parking position, and perimeter.

d. Fire Pump Station. A building of approximately 50 ft by 80 ft would hold the controls, power panels, pumps, valves, and diesel power units for all land-based and mooring facility firefighting equipment and systems and for the emergency engine generator units (Figure 2.2.1-4).

e. Site Drainage and Oil/Water Separator. All loading platform and shoreside catch basins would direct surface runoff to an oil/water separator and clarifier. Separated oil would be tested and then transferred to the oil storage area. Oil-free water would be discharged to the harbor. An NPDES discharge permit would be required, and discharges would meet regulatory requirements and standards.

f. Access. Two 100-ft-wide shoreline strips of land would provide access to the loading platforms, and two 50-ft-wide shoreline strips of land would provide access to the mooring dolphins.

2. Storage Tanks. The proposed storage terminal on the proposed landfill island would provide transient storage for approximately 5.6 million barrels of crude oil. The crude oil would be stored in eight floating roof tanks, consisting of two tanks with a 950,000-barrel-capacity each, two tanks with an 800,000-barrel-capacity each, two tanks with a 675,000-barrel-capacity each, and two 375,000-barrel-capacity tanks. All storage tanks would be equipped with floating roofs to minimize oil evaporation losses.

After construction, each tank would be given a hydrostatic test to confirm the foundation design and to test the foundation and shell. A preliminary plot plan of the POLA tank farm is shown in Figure 2.2.1-6. The terminal would be fenced. There would be no refining at the POLA facility.

D. Pipeline

The Pactex pipeline would consist of the following components:

(1) 1,031 miles of buried 42-in.-diameter pipeline
(2) 71 block and check valves

A single 42-in.-diameter buried pipeline would be constructed from the initial pump station adjacent to the Wilmington Liquid Bulk Tank Farm in POLA to a terminal facility at Midland, Texas, a distance of approximately 1,031 miles. There would be a total of 11 en route pump stations. Figure 1-1 gives an overview of the pipeline route. Alignment maps are shown in Appendix J.

The proposed pipeline would be designed in compliance with the Code of Federal Regulations, Title 49, Section 195, and the Code for Pressure Piping, ANSI B31.4. The pipe would be installed with necessary fittings for a cathodic protection system, and access would be maintained to allow for system startup and testing. The number and location of these systems would be based on the pipe-to-soil potential determined after construction. Corrosion protection test stations would be installed at least every 10 miles to test the performance of the cathodic protection system.

Although a spill from any portion of the pipeline would be of concern, the pipeline ROW intersects some drainage and topographic features where a spill could produce hazards or environmental problems of particular concern. To limit the amount of oil that could leak in a catastrophic event, valves would be placed at minimum intervals as specified by Department of Transportation (DOT) regulations. Block valves would be installed upstream of the pump stations and on the upstream side of major stream crossings. Check valves would be installed on the downstream side of pump stations, at major stream crossings, and at sections of significant elevation gains. These valves would be located outside stream meanderings and above the high-water line of the 100-year floodplain. The alignment sheets in Appendix J show the locations of the block and check valves. Estimated quantities of potential spills in sensitive areas are listed in subsection 4.2.17.

Remote control block valves installed at the sensitive areas identified in subsection 4.2.17 would be operated in one of two basic ways. One design would use an electric motor to open and close the valve and would require electrical power. The second approach would use a pneumatic or hydraulic actuator. Energy would be supplied by bottled nitrogen gas or from solar panels that would operate a small hydraulic pump at the valve. The second method would be used at block valve sites that are too remote to be supplied with line power. Either system can be supplemented by portable mechanical systems that can be brought to the site.

An Oil Spill Contingency Plan (OSCP) would be prepared for the pipeline by the operator. An outline of the OSCP is presented in Appendix G.

E. Pump Stations

Eleven pump stations would be located along the route. The pump stations and typical utility requirements are listed in Table 2.2.1-4. Pumping stations are used to lift the crude oil so that it flows toward the next pump station at the design rate. Extensive hydraulic studies are carried out to determine the ideal station locations, taking into consideration the flow characteristics of the crude oil, the elevation of the station location, and the allowable working pressure of the line pipe under DOT safety regulations. Stations are usually located near the source of power and near a reasonable access road to minimize the need for new construction of powerlines and access roads.

A plot plan for a typical pump station is shown in Figure 2.2.1-7. The stations and centrifugal pumps are in series. Stations will use one, two, or three operating units and may have a standby unit depending on the location.

Table 2.2.1-4 - Pump Station Utility Requirements

Pump Station	Milepost (approx)	Elevation (ft)	hp	Source	Tap Length (miles)	Access Roads
California						
Wilmington	0	100	20,000	Dept. of Water and Power	0.25	Existing roads
Rialto	71	947	20,000	Southern California Edison	0.25	From I-10, Riverside Avenue
Blythe	228	390	12,000	Southern California Edison	0.25	Existing road 1 mile from Nicholls Warm Springs
Arizona						
La Posa	264	1,200	12,000	Arizona Public Service	9	1/4-mile new access road
Gila	370	1,207	20,000	Arizona Public Service	1	Improve 1/2 mile of existing pipeline road.
Coolidge	452	2,374	20,000	Arizona Public Service	0.25	1/4-mile new access road from H-80.
Redington	508	3,395	18,000	Sulphur Springs Valley Electric Co-op	1	2 miles new road from San Pedro River Rd.
New Mexico						
Lordsburg	602	4,146	16,000	Texas-New Mexico Power Co.	13	3/4-mile new road from Southern Pacific Railroad
Akela	689	4,110	18,000	Columbus Electric Co-op	4	1/8-mile improved surface road to existing road connecting Akila Interchange, I-10
Jal	957	3,018	6,000	Southwestern Public Services	8	1/8-mile improved surface on pipeline road from H-18.
Texas						
Hueco	771	4,327	18,000	El Paso Electric Co.	8	2 miles improved surface on existing pipeline road.

Source: Pactex, 1985; ES, 1985.

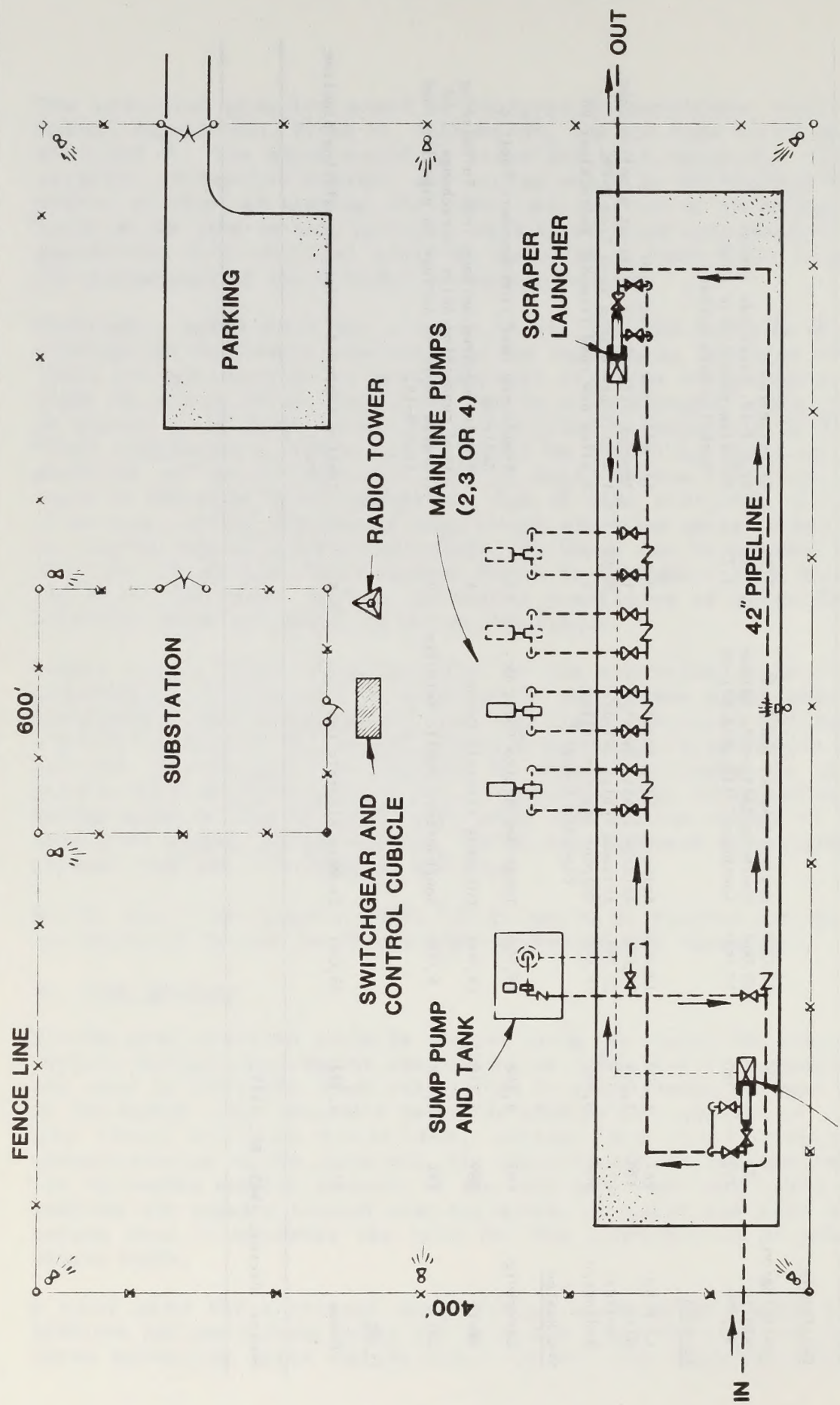


Figure 2.2.1-7 - Pump Station (typical layout, not to scale)
(Pactex, 1985)

The individual pump units range in size from 4,000 to 10,000 hp with station operating requirements of up to 20,000 hp. A typical size (area) is approximately 5.5 acres. This could vary slightly depending on the terrain at individual locations and the shape of the property.

Each station would consist of electric motor-driven pumps, valve assemblies, an underground sump tank, and a small equipment building containing electrical equipment, monitoring controls, and an automatic shutdown system. A building would not enclose the pumps. Each pump station would also contain communications equipment both to relay operating data to a master control center located in Los Angeles and to receive remote operating commands from the control center. This communication system would be required to control pump station operations. Minimal facilities would be required for this communication system because Pactex would be using an existing microwave network. In addition, space would be made available for small tools and minor maintenance items. The station area would be fenced and landscaped.

F. Midland Terminal

A terminal facility (Figure 2.2.1-8) is proposed to be constructed at Midland, Texas, on a 100-acre site. The proposed location was formerly a tank farm. The terminal would be designed to provide transient storage for up to 4 million barrels of oil. Eight floating roof storage tanks would be constructed with a capacity of 500,000 barrels each. The terminal would receive crude oil from the pipeline system and, in turn, would distribute oil to existing pipelines for transportation to the midcontinent, east coast, and gulf coast regions. The Midland terminal would be able to connect to 14 other pipeline systems that serve up to 75 existing refineries. There will be no refinery at the Midland terminal.

The terminals at POLA and Midland would be designed to meet secondary containment requirements established by the DOT and the National Fire Protection Association (NFPA). A containment dike would provide containment for 110% of the largest tank's volume. Access ramps would be provided for service vehicles. The surface enclosed by the dikes would be graded to direct the flow of stormwater into a catch basin at one end. Collection sumps and sump pumps would be installed for areas around scraper traps and meters where contamination with oil could occur. A spill prevention control and countermeasure (SPCC) plan would be prepared for the terminal storage areas using guidelines set forth by the EPA (40 CFR 112.7). Portable and fixed fire-extinguishing systems would be installed at the terminal areas, and a firefighting plan would be prepared for the terminals (see Appendix H).

2.2.2 CONSTRUCTION PHASING AND MANPOWER REQUIREMENTS OVERVIEW

The first construction phase is intended to achieve initial pipeline system operation in 18 months. Construction of the pipeline system would be accomplished using construction spread teams working concurrently on different segments of the 1,031-mile pipeline. Construction crews would normally work 12-hour days, 5 to 7 days per week.

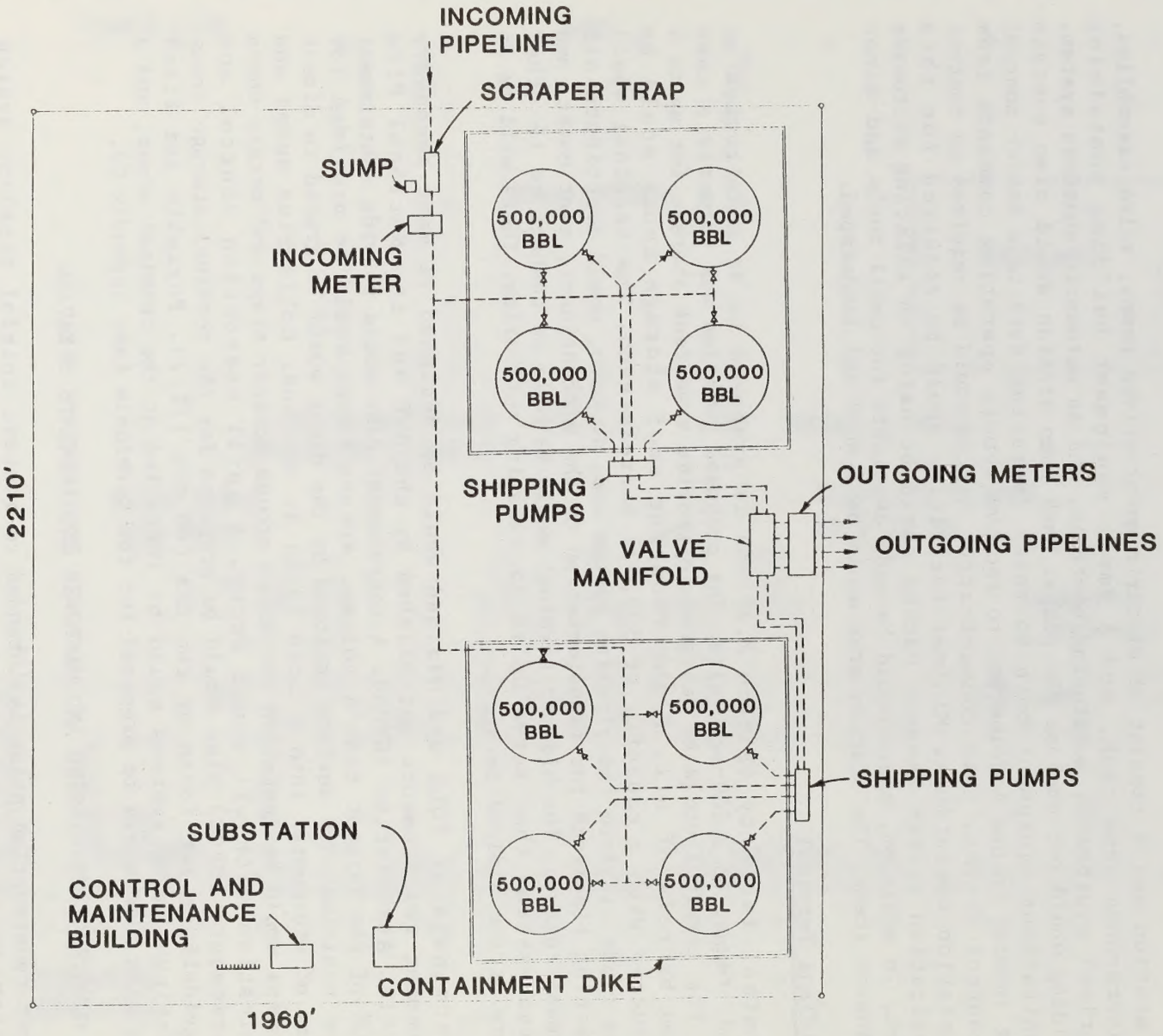


Figure 2.2.1-8 - Midland Terminal Facility (not to scale)
(Pactex, 1985)

There would be five 60-person construction crews between POLA and Banning. Approximately 600 ft per day of pipeline construction would be completed in this area. At the same time, four 350-person construction crews would be at work in the Banning-Midland corridor. Progress in this corridor is estimated at 1 mile per day. An additional 250 workers would be involved in the transportation of pipe. Four 50-worker crews would be engaged in river-crossing construction, and would precede the pipelaying crew. River crossing crews would remain up to 6 weeks in one location.

Five pump stations would be constructed during the initial phase. The remaining six stations would be constructed over an 18-month period following initial system operation. Four 50-person crews would construct the pump stations, each of which would require a 4- to 6-month construction period.

A construction work force of 200 people would be required for POLA berthing and marine construction, and 100 people would be required for construction of the POLA terminal. Construction of the Midland Terminal would also require 300 workers. Construction manpower requirements are summarized in Table 2.2.2-1.

Table 2.2.2-1 - Summary of Pactex Project Construction Manpower Requirements

Construction Task	Number of Crews	Manpower per Crew	Total Manpower Requirements
Pipeline			
Banning to Midland	4	350	1,400
POLA to Banning	5	50	250
Pump stations	4	50	200
River crossings	4	50	200
Midland terminal	-	-	300
POLA			
Berthing	-	-	200
Marine terminal	-	-	100
Transportation of pipe	-	-	250
Construction Management	-	-	100
Total	-	-	3,000

Source: Pactex, 1985.

Construction management for all aspects of the pipeline project would require 100 people.

2.2.3 POLA BERTHING/MARINE CONSTRUCTION

Marine construction would involve dredging and landfill construction, pile installation, berth platform construction, a submarine pipeline, and a seawater intake and outfall. Construction of these facilities would be accomplished with conventional marine construction equipment. Facilities to be constructed or installed would include the wharf, crude oil tanker offloading arms, the innovative technology air pollution control system, pipelines, and utilities. Installation of the equipment on the marine structures would use floating work barges and land-based equipment.

A construction staging area of up to 40 acres would be required. The staging area would be a fenced, lighted area located on the existing 190-acre landfill site within POLA that has existing road access. The staging area would be used for receipt, storage, and transport of materials and equipment, as well as for construction parking. All equipment and materials required for construction on the proposed landfill island would be transported from the staging area. A temporary dock would be installed to permit loading the barges and crew boats. Environmental impacts associated with dock construction are incorporated in this document by reference to the Final EIR for the Kaiser Steel, Terminal Island Project (LAHD, 1983). Pipeline sections would arrive precoated; therefore, no sandblasting, coating, or painting would be required. Pipe sections may be double-jointed at the staging area (two sections welded together) and transported to the construction site for installation. The construction work force is estimated at 200 people.

A. Dredging and Island Construction

1. Proposed Landfill Island. The island would be sited 0.5 mile north of and just to the east of Angel's Gate. The outer entrance channel, entrance channel, turning basin, and mooring area would be dredged to 75 ft. Dredge material would be used to develop a landfill island of 115 acres (Figure 2.2.1-1).

2. Shipping Channels. All waterways and berthing areas associated with this project would be dredged to a depth of -75 ft MLLW, which would permit vessels with drafts of up to 70 ft to enter and use this oil terminal. The underwater channel-cut slopes would be contoured at a 3:1 (horizontal to vertical) ratio; however, these slopes may stabilize at 4:1 or 5:1 because of the fineness of the material.

Dredging of the channels, turning basin, and berthing areas would primarily be accomplished by the use of an electric cutter/suction dredge. Either a hopper or a floating grab dredge could dredge the outer entrance channel (600 ft wide by 6,600 ft long) located outside the breakwater because this type of dredge can operate in unprotected waters. The electric cutter/suction dredge would excavate the major portion of the dredge material behind the breakwater. A floating grab dredge or clamshell dredge would excavate the pipeline trench to be constructed between the proposed landfill island and Terminal Island.

3. Slope Protection. A rock dike side slope of 2:1 (horizontal to vertical) was selected. This slope design may be refined as the result of additional geotechnical investigations.

In the berthing areas, the slope protection would extend from the toe of the slope at -75 ft MLLW to the top of the dike at +20 ft MLLW and, because of wave exposure, would contain large armor stone in the upper third of the slope. A portion of the west side of the island would be protected, as appropriate. The east side of the island would require slope protection rock of smaller size, because this portion of the island would be well sheltered by the breakwater. Rock protection on this side would start at -35 ft MLLW and would continue up to +20 ft MLLW.

The rock-diked sections could be built using either the single-lift or multilift dike construction method. The single-lift method involves the placement of quarry run material from the toe of the slope to +5 ft MLLW in one dike, with the placement of dredge fill behind it in one continuous operation. The multilift approach to dike construction requires the placement, in steps, of a number of smaller rock dikes, approximately 15 ft high, with the placement of dredge fill behind this section as each lift is completed.

Figure 2.2.3-1 depicts a typical cross section of the rock dike/slope protection for the south rock dike. All rock would be expected to be imported from existing quarries in Santa Catalina Island, California. The rock required is estimated to be 2.9 million tons.

4. Structural Design. The type of construction to be used for the loading platform (i.e., the two breasting dolphins and four mooring dolphins) would consist of 54-in.-diameter steel piles with 2-in. wall thickness driven to a depth of 60 ft below the mudline and interconnected at the top by a lattice of steel beams supporting a cast-in-place concrete deck. The exact size and number of piles required and the specified top elevation could vary depending on the results of the final geotechnical investigation. It is proposed that 170 steel piles (54 in.) and 48 concrete piles (24 in.) be used for the dolphins and the supply wharf. After the piles had been driven, the platform would be installed according to the as-built location of the piles.

The breasting dolphins (approximately 50 ft by 35 ft) would be designed to accommodate a tanker with the following characteristics:

Tanker	Specification
Maximum cargo capacity	225,000 dwt
Draft (loaded)	70 ft
Length (perpendiculars)	1,100 ft

The mooring dolphins (approximately 25 ft by 25 ft), primarily designed for longitudinal wind and surge loads, would require four pipe piles for each dolphin. The loading platform (approximately 100 ft by 190 ft) would be designed for standard H-20 truck loading and a uniform live load of 750 lb/ft^2 to accommodate product lines and other heavy equipment.

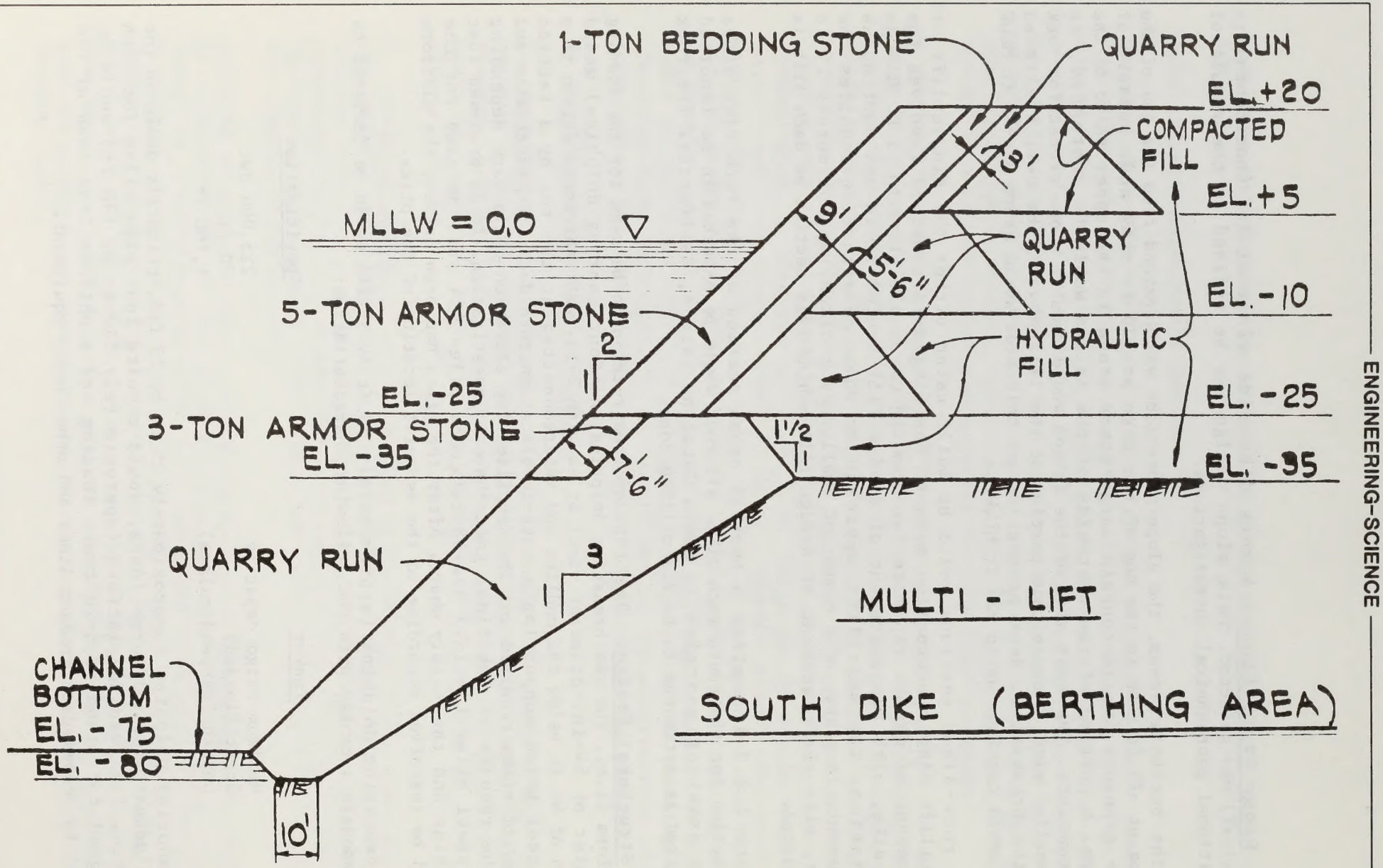


Figure 2.2.3-1 - Rock Dike/Slope Protection (typical cross section, not to scale)
(Pactex, 1985)

B. Construction of Berthing Facilities

Two fixed berths would be constructed adjacent to the proposed landfill island. Steel mooring and breasting dolphins would be driven into the harbor bed. Impact-absorbing fenders would absorb tanker movement at the berths. A platform to support the marine offloading arms would be set back from the breasting line. A separate platform would support the air emission control system.

The preliminary plan for each berthing facility would consist of two breasting dolphins located at the 225,000-dwt vessel's quarter points and at the toe of the berthing area. Located between the breasting dolphins would be a 100-ft-wide by 180-ft-long transfer platform on which the four marine loading arms and collection piping would be positioned. Four mooring dolphins would be located outboard of the vessel and approximately 80 ft in front of the top of the rock slope. Both the mooring and breasting dolphins would be accessible by catwalk either from land or the transfer platform. Between the stern breasting dolphin and the mooring dolphins, a 60-ft-wide by 200-ft-long marginal pier would be constructed to support the ship emission control equipment. The final orientation of dolphins and platforms might differ from the indicated locations as more information is obtained on the hull configurations for the classes of vessels.

A supply wharf approximately 60 ft wide by 200 ft long would be located between the two berthing areas. This wharf would be used to transfer personnel, remove waste products, and resupply the terminal with potable water, fuel, and operational materials. The oil containment equipment (oil boom and work boat) would also be located at this wharf.

C. Construction of Submarine Pipelines

A concrete-encased 42-in.-diameter pipeline from the proposed landfill island to shore would be constructed by conventional marine pipeline techniques. A trench would be dredged for the pipeline that would be placed in the trench and backfilled with the material that was dredged for the trench. The bottom of the trench would be approximately 7 ft wide. Side slopes are estimated at 2:1. A block valve would be installed on the proposed landfill island, and a check valve would be installed as the pipeline goes onshore (Figure 2.2.3-2). During final design, marine experts would recommend construction details to minimize accidental damage to the pipeline by ship anchors.

There would be a submarine crossing of the Cerritos Channel. A concrete-encased 42-in. pipeline section would be lowered into a predredged trench below the channel bottom. Design and construction details will be agreed on with COE and LAHD authorities.

2.2.4 POLA TERMINAL CONSTRUCTION

Construction activities at the oil storage terminal at POLA would consist of tank foundations, storage tank erection, mechanical and electrical construction, and security fencing installation. The construction work force is estimated at 100 people. The construction schedule is designed to have the

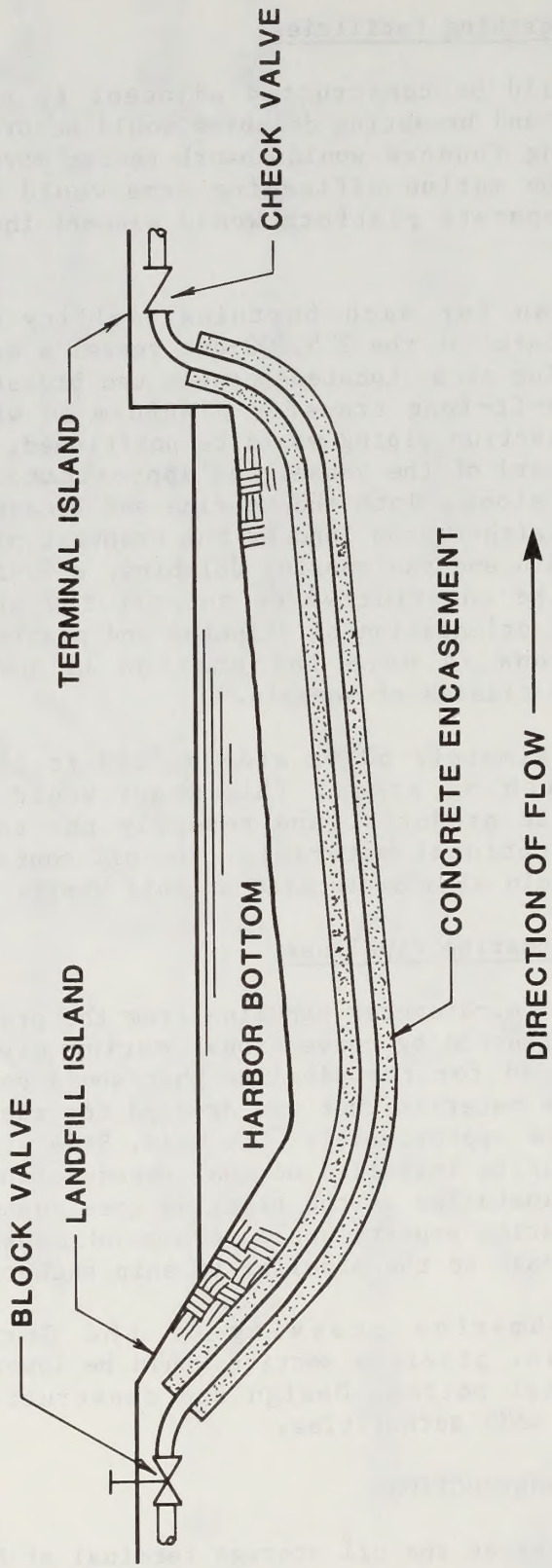


Figure 2.2.3-2 - Submarine Pipeline (not to scale)
(Pactex, 1985)

proposed landfill island, offloading facilities, and pipeline completed before completion of the tank farm. If this occurs, existing tankage at the Wilmington Liquid Bulk Tank Farm could be used for interim crude oil storage. The terminal is located in Wilmington next to the first pump station. Minimal work would be required to run piping from the pipeline to the terminal.

A. Tank Erection

The design, material fabrication, and erection of the storage tanks would be performed by a tank-contracting specialist. Fabrication, forming, and cutting of steel plates would be performed by the tank contractor at a fabrication plant prior to delivery to the terminal site. On delivery to the site, tank erection crews would construct the storage tanks. Plates would be joined by welding using both automatic and manual techniques. Large flatbed trucks and/or barges would deliver the plates from the fabrication plant to the erection site. Delivery of plates would be spread through the erection schedule to permit efficient handling and storage. Conventional cranes would move the plates into position for welding. All exposed steel surfaces of the finished storage tanks would have received shop cleaning and priming prior to onsite delivery, thereby minimizing the need for field sandblasting. Onsite cleaning and priming would be limited to the repair of coating damage that occurred during transit and hauling. The tanks would receive a final protective coating of paint following erection.

Tank erection would take approximately 13 months with the concurrent erection of several tanks. Crews specializing in installation of tank bottoms, shell erection, and floating roofs would move from tank to tank completing their specific tasks. After erection is complete, the tanks would be given a hydrostatic test. This testing would be at a controlled rate conforming with the foundation design to preload and test the foundation as well as the tank shell.

B. Mechanical and Electrical Construction

Mechanical and electrical construction of the terminal facilities would be performed by one or more contracting firms equipped to handle this type of installation. Facilities to be constructed or installed would include pipelines and utilities from the berthing facility to the terminal, terminal piping, pumping equipment, and controls. Piping would be fabricated at factories to the extent practical to reduce site work. Facilities would be installed using the conventional tools and equipment of the trades involved. Construction duration would be approximately 12 months and would reach peak activity levels when tank erection has progressed sufficiently to permit installation of all equipment associated with these facilities.

C. Security

A chain link fence would be constructed around the facilities for security. The area would be lighted.

2.2.5 PIPELINE SYSTEM CONSTRUCTION

A. Construction Methods

Construction of the proposed pipeline would be accomplished using construction spread teams working concurrently on several portions of the pipeline system. Each spread team would be responsible for all aspects of construction along their spread. Figure 2.2.5-1 represents a typical cross-country pipeline spread. Normally construction would take place between 7 a.m. and 5 p.m., 6 days per week. There would be five construction spreads between POLA and Banning with about a 60-person crew per spread. These five construction spreads would work through industrial and populated areas. Approximately 600 ft per day of pipeline construction are estimated to be completed in each of these spreads. Four construction spreads would be east of Banning with up to a 350-person crew for each spread. Progress in these cross-country spreads is estimated at up to 1 mile per day for each spread.

Each mainline pipeline spread would be made up of several units, each having a separate function. The units would be organized to proceed with the work in the following general order: clearing and grading the ROW, hauling and stringing the line pipe, ditching, pipe bending, laying and welding, applying protective coating, lowering and tying-in, backfilling, testing, and ROW cleanup and restoration. Special construction would consist of fence building, road and railroad crossings, water crossings, and valve installations. A 50-person crew is estimated at river crossings. In open country, this type of construction would be ahead of the pipelaying crews.

A general description of the various construction units follows.

1. Preconstruction Activity. ROW acquisition and surveying would entail major field operations prior to construction. The right to construct, operate, and maintain the pipeline would be obtained primarily by purchase or permit from landowners and responsible agencies. In most cases, ROW agreements provide that the pipeline company may survey; clear by cutting timber, brush, and crops to a specified width; construct the pipeline; restore the surface so that the owner's usual use of the land may be continued; and have access to the pipeline for future O&M. Some parcels of land may be purchased by the pipeline company. The location of the pipeline is described by a surveyed centerline description of its route across each piece of property. Permits would be obtained, as required, for construction and to cross railroads, highways, roads, streets, rivers, canals, irrigation or drainage ditches, and various other facilities. Ground survey crews would plot all topographic features that could affect the laying of the pipeline.

2. ROW Width Required. Construction activities would be confined to a 100-ft ROW width along the proposed route, except for temporary staging areas at river crossings and other special points requiring temporary use of extra widths as may be agreed upon with landowners or agencies having jurisdiction.

3. ROW Clearing and Grading. One of the first jobs encountered would be to install gates in fences that cross the ROW. Permanent fence repairs would be completed during final cleanup operations.

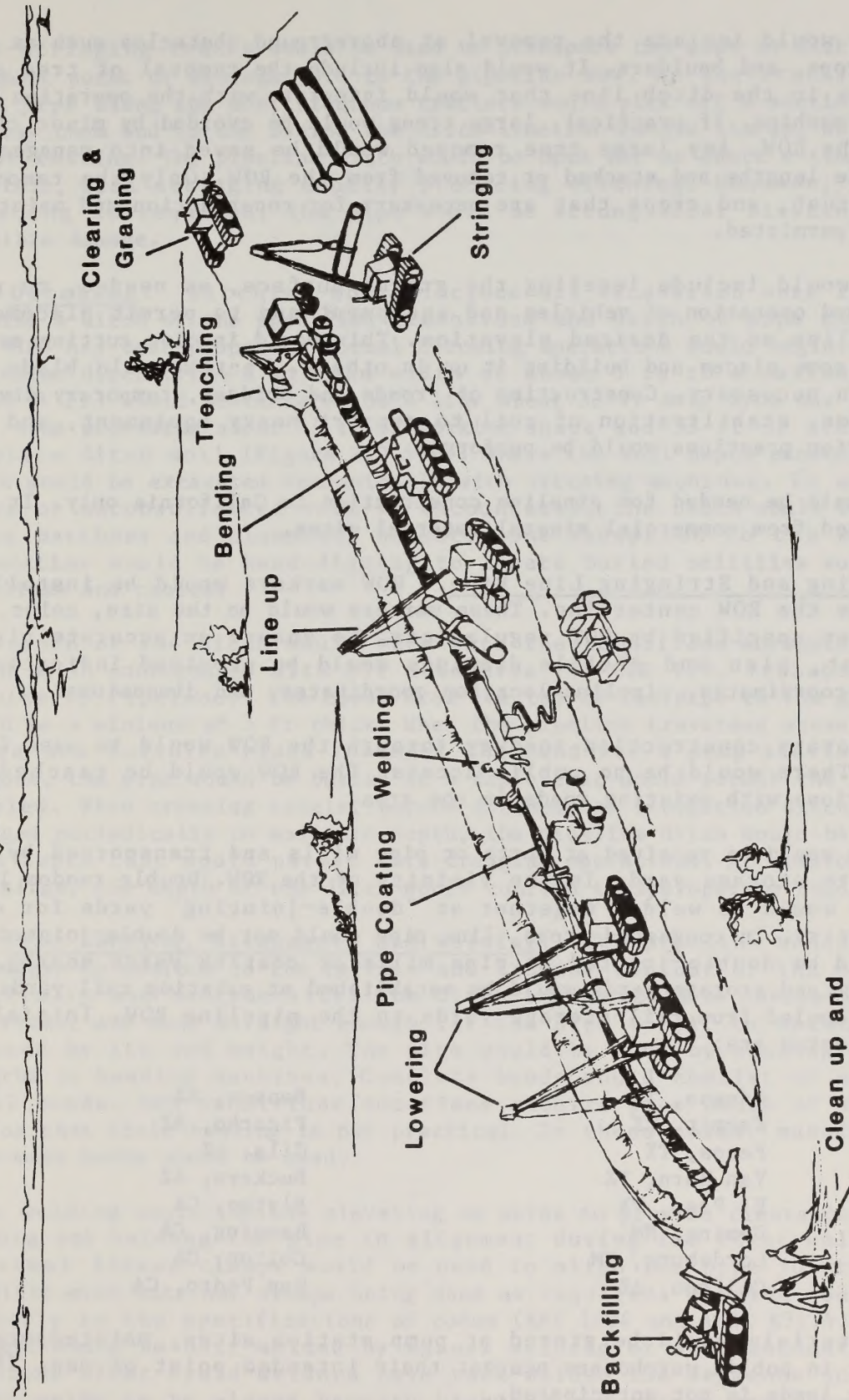


Figure 2.2.5-1 - Cross-Country Construction Pipeline Spread (typical, not to scale) (BLM, 1984a)

Clearing would include the removal of aboveground obstacles such as trees, brush, crops, and boulders. It would also include the removal of tree stumps and roots in the ditch line that would interfere with the operation of the ditching machine. If practical, large trees would be avoided by minor changes within the ROW. Any large tree removed would be sawed into manageable or marketable lengths and stacked or removed from the ROW. Only the removal of trees, brush, and crops that are necessary for construction and maintenance would be permitted.

Grading would include leveling the ground surface, as needed, to permit transit and operation of vehicles and equipment and to permit placement of the pipeline at the desired elevation. This would involve cutting away the earth in some places and building it up in others. Pactex would blade level only when necessary. Construction of roads and bridges, temporary diversion of streams, stabilization of soil to support heavy equipment, and other construction practices would be performed.

Gravel would be needed for pipeline construction in California only. It would be obtained from commercial mineral material sites.

4. Hauling and Stringing Line Pipe. ROW markers would be installed to delineate the ROW centerline. These markers would be the size, color, type, and number specified by DOT regulations. To ensure an accurate pipeline alignment, plan and profile drawings would be provided indicating the boundary coordinates, pipeline location coordinates, and dimensions.

The temporary construction roadway through the ROW would be used for all access. There would be no public access. The ROW would be reached from intersections with existing roads in the area.

Line pipe would be received at ports or pipe mills and transported by truck or rail to storage yards in the vicinity of the ROW. Double random lengths (±40 ft) would be welded together at "double-jointing" yards for use in open country. In congested areas, line pipe would not be double-jointed. Line pipe would be double-jointed at pipe mills or coating yards nearby. Pipe receiving and storage yards would be established at existing rail yards. Pipe would be hauled from rail storage yards to the pipeline ROW. Initial rail yards selected are:

Odessa, TX	Benson, AZ
Kermit, TX	Picacho, AZ
Pecos, TX	Gila, AZ
Van Horn, TX	Buckeye, AZ
El Paso, TX	Blythe, CA
Deming, NM	Banning, CA
Lordsburg, NM	Colton, CA
Clifton, AZ	San Pedro, CA

Other materials would be stored at pump station sites, maintenance yard sites, or in public warehouses nearest their intended point of use. The use of public lands is not anticipated.

Pipe-stringing trucks would be used to transport the pipe in sections from a shipment point or storage yard to the pipeline ROW. As the trucks carry the line pipe along the ROW, sideboom tractors would pick off a section at a time and lay them end to end beside the ditch line for future lineup, welding, and joint coating. The pipeline ditch would be open for as short a time period as possible, with stringing usually preceding ditching. However, where rock blasting is required, the pipe would be strung after blasting to avoid possible damage.

5. Ditching. Ditching would include all excavation work required to provide a ditch of the specified dimensions and depth of pipe cover. After the ROW has been prepared, normal ditching operations would begin. A standard dimension ditch (from a minimum width of about 5 ft to a maximum width of about 8 ft) would be centered on a line about 33 ft away from one edge of the ROW, thus providing about 67 ft of working space and 33 ft of area in which to place ditch soil (Figure 2.2.5-2). Where the soil depth exceeds 6 ft, the ditch would be excavated mechanically with ditching machines. In areas where loose or unconsolidated rock is encountered, the ditch would be excavated using backhoes and clamshell buckets. One exception to the mechanical excavation would be hand-digging to locate buried utilities such as other pipelines and cables.

The depth of the ditch would vary with the conditions encountered. Depths would be in conformance with DOT standards (49 CFR 195, Transportation of Liquids by Pipeline). The cover from the top of the pipe to the ground level would be a minimum of 3 ft thick. When the pipeline traverses areas for which there are definite plans to level the land for a pump station or other purpose, the pipe would be buried at a depth that would permit the land to be leveled. When crossing canals, borrow ditches, or irrigation ditches that are dredged periodically to maintain depth, the pipeline ditch would be excavated to a depth that would permit safe dredging operations. At railroad and road crossings, the depth of the ditch would conform to appropriate regulations.

6. Pipe Bending, Alignment, and Welding. The pipeline would be bent as necessary to conform to the terrain and fit the contour of the ditch, both vertically and horizontally. The ditch bottom would be leveled, as much as practical, and made straight enough for the pipe to fit by natural flexure induced by its own weight. The pipe would be bent by placing individual lengths in bending machines. Complete bends would consist of a series of small bends. ROW conditions sometimes require pipe bends of such a short radius that field bending is not practical. In these cases, manufactured or shop-made bends would be used.

Pipe welding would include elevating on skids to provide clearance lineup for welding and holding the pipe in alignment during the first welding pass. Internal lineup clamps would be used to align the pipe joints whenever possible with external clamps being used as required. Welding would conform strictly to the specifications of codes (API 1104 and ANSI B31.4). Each pipe segment would be butt-welded by manual welding or with automatic welding machines after field welders have tack-welded the segments in place. All girth welds to be placed beneath highways and rivers would be inspected radiographically before installation. At least 10% of the welds made each day

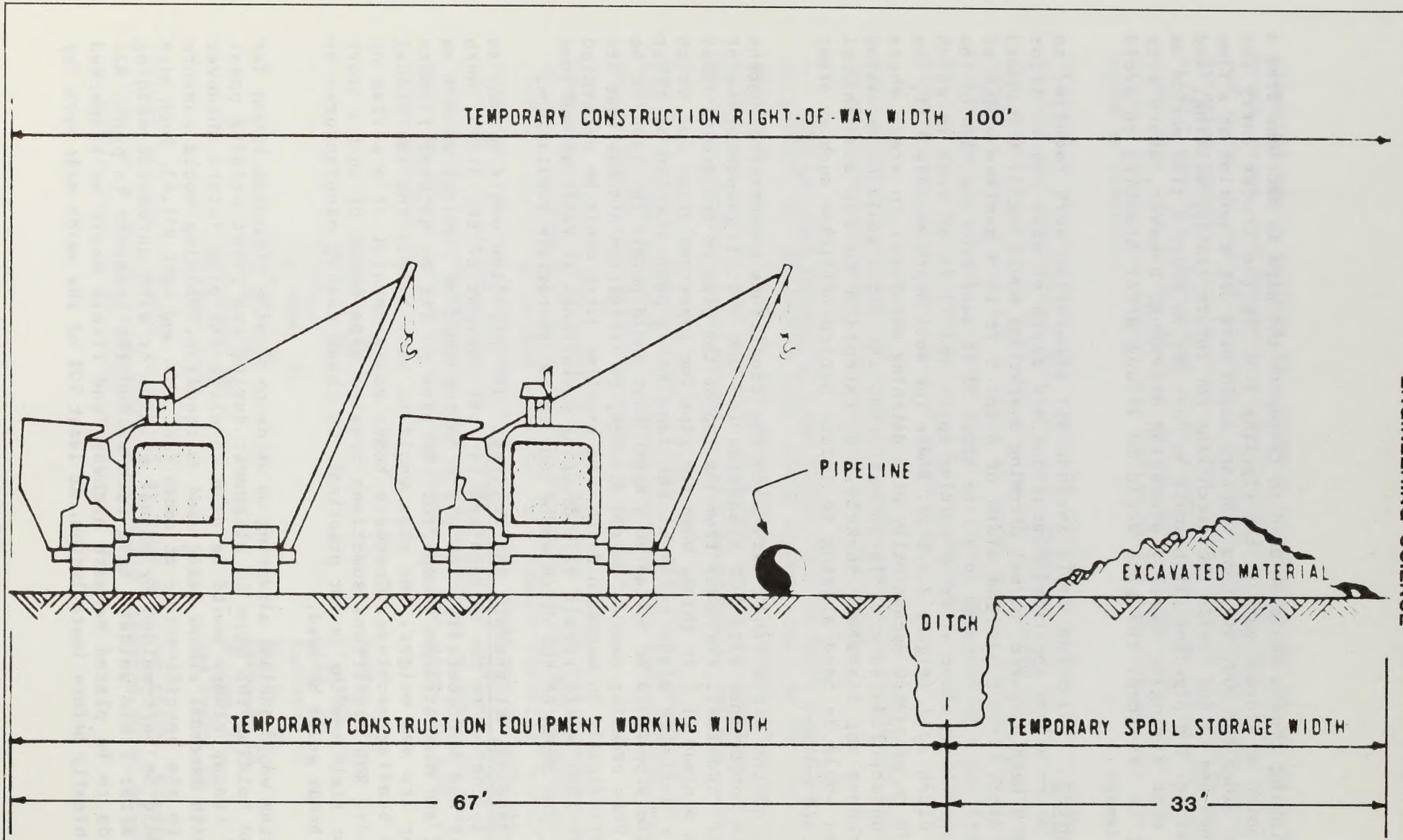


Figure 2.2.5-2 - Ditch Spoil Placement (not to scale)
(Pactex, 1985)

by each welder would be inspected radiographically in all other locations. Pactex may require up to 100% radiographic inspection.

7. Protective Coating. The pipe coating would be either mill or field applied after having thoroughly removed all dirt, rust, and loose mill scale from the surface. Approved methods of transportation and handling of coated pipe would be rigidly followed to protect the coating. All weld joint areas and areas damaged in transit would be repaired and coated prior to lowering or backfilling.

Inspection of all required phases of the coating operation would be made to ensure that each step in the procedure is performed properly. Coating discontinuities that permit moisture to reach the pipe would be located by an electrical "holiday" detector, which is a device that develops an electrical potential between the pipe and an electrode in contact with the outside of the coating or ground. The electrical potential is high enough to produce an arc in the air that is longer than the coating thickness but not high enough to produce an arc through a satisfactory thickness of coating. Pinholes of microscopic size can be detected. All coated pipe would be tested prior to backfilling.

8. Lowering and Tying-in. The pipe would be lifted and lowered into the ditch by two or more sideboom tractors acting in unison and spaced so that the weight of unsupported pipe would not cause buckling or other damage. Rubber rollers or padded slings would be used so that the tractors can lower the pipe without damage as they travel along the ditch line.

A tie-in would be required whenever there is a break in the continuous operation of the mainline pipe gang. This break will occur at road crossings, water crossings, valves, and other special locations. Tie-in welds are usually made in the ditch at the final elevation, and each weld would require pipe handling for lineup, cutting to exact length, pipe cleaning and coating, and backfilling, in addition to normal welding and weld inspection.

9. Backfilling. Backfilling procedures would comply with specifications regarding protection of pipe and coatings. Motor graders, angle dozers, and crawler-mounted side-pull backfillers would be used to move dirt from the spoil bank to the ditch. Where necessary, the backfilled earth would be compacted to avoid later settling, which would leave a surface depression. In certain areas where damage may occur to the pipe coating, additional protection would be provided by padding the ditch with clean sand backfill and/or using rock-shield padding.

Small amounts of materials that cannot be placed in the ditch would be crowned on top of the ditch to compensate for future settling, provided this does not adversely affect the drainage of surface waters. The remainder of the ROW would be graded, where needed, and all disturbed surfaces would be restored to the approximate preconstruction contours. Backfill would be graded and compacted, where necessary, for stability. After backfilling the ditch, the ROW and any other area affected would be cleaned of trash, brush, and other debris to prevent fire hazards. Some brush would be used to assist in stabilization and revegetation of the line (as mulch) and to break up surface flow along long slopes.

B. Special Construction

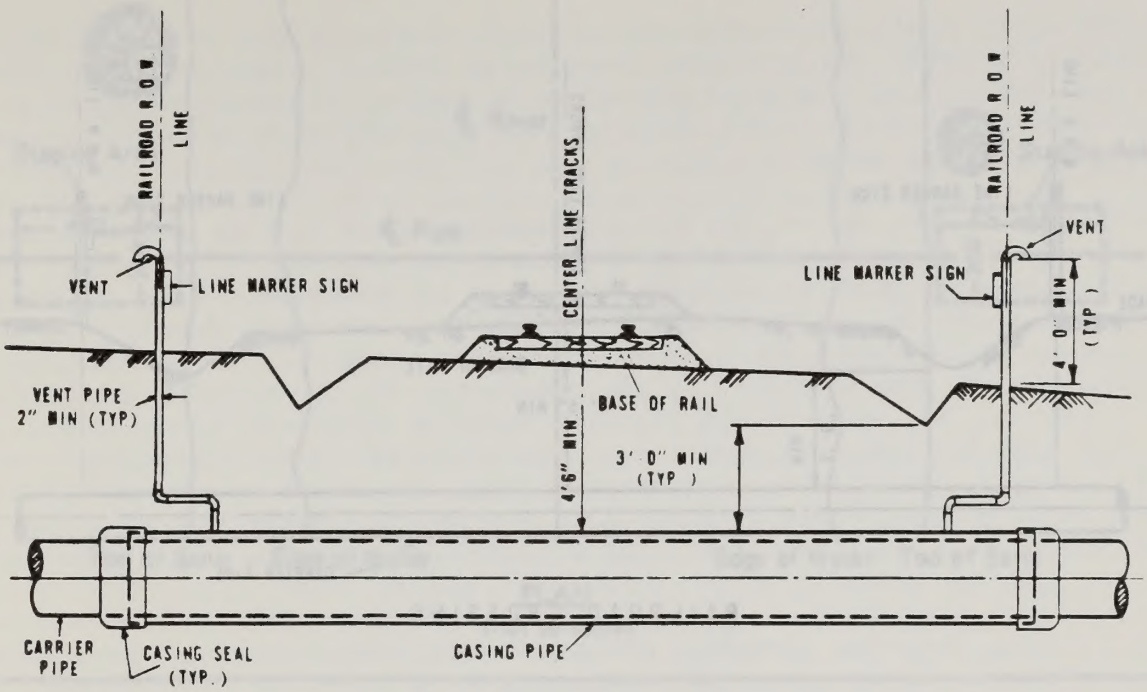
Some items of construction would require the use of specialized equipment and procedures. Typical jobs requiring special construction follow.

1. Highway and Railroad Crossings. Certain roadbeds supporting roadways or railroads would be crossed by boring a hole horizontally from one side to the other. Steel or concrete casing would be used to encase road crossings as required by the relevant authorities. Figures 2.2.5-3 and 2.2.5-4 show typical cased and uncased crossings.

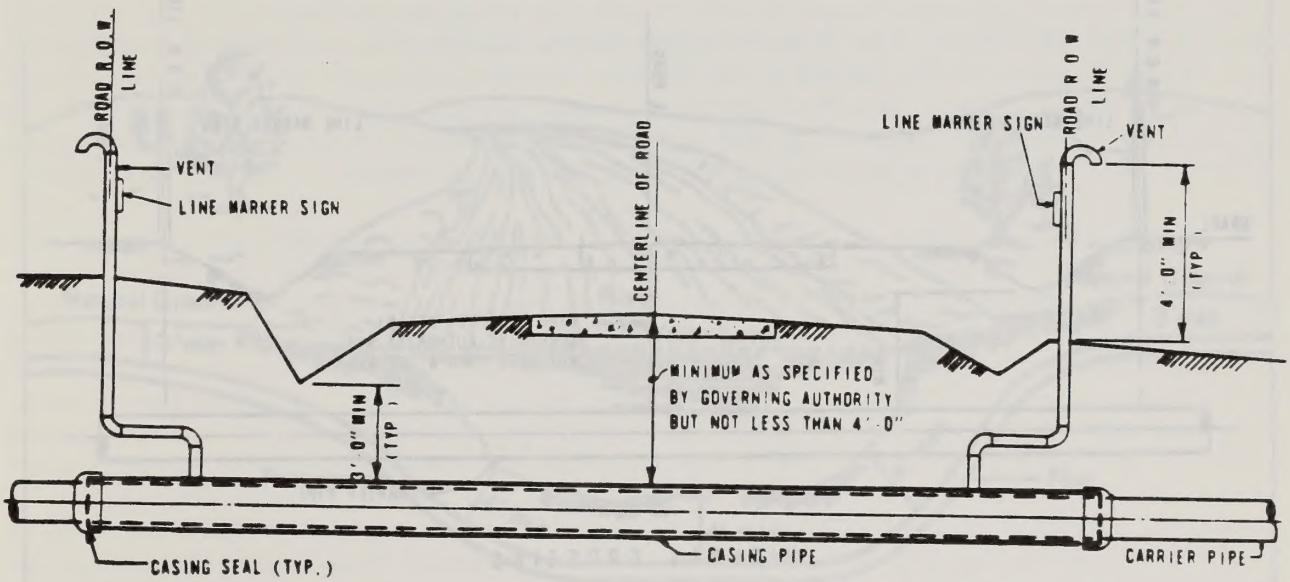
2. Water Crossings. At the major water crossings, cleared working areas approximately 250 ft wide (and parallel to the river) by 450 ft deep (2.5 acres) would be needed on each side. Within California, these would be the San Gabriel River, San Jose Creek, Whittier Wash, Santa Ana River, San Timoteo Creek, and the Colorado River. The precise size and location of these working areas would be determined after a detailed engineering analysis has been made of the crossing sites. The water crossing points would be selected carefully to minimize the disturbance of riverbeds or banks. Preliminary crossing locations for the San Gabriel River, Santa Ana River, San Timoteo Creek, and Colorado River are shown in Appendix J. The pipeline would be buried under the main channel.

Because of the width and depth of the Colorado River, crossings would require extra working space for construction activities. A total of 12 acres of land would be needed during construction in addition to that required for the upland approach to the river. The extra space would be confined mainly to one side of the river and would involve a corridor of land approximately 250 ft to 300 ft wide by 1,200 ft long. The crossing would require about 6 weeks of preparation and 2 days to pass the pipe under the river. For other river crossings, the ditch would be approximately 80 ft to 90 ft wide at the riverbed surface and 16 ft to 18 ft below the riverbed.

Pipeline construction at river crossings could be temporarily halted during periods of high river flow (usually late spring) when necessary to control erosion adequately. Figure 2.2.5-5 illustrates a typical river crossing (plan and profile). Construction of crossings normally would be accomplished within 2 weeks. The pipeline would be installed beneath flowing streams by drawing the pipe under the river from one side of the channel, or by boring, or by excavating a trench using corrugated sheet metal cofferdams. Pactex anticipates trenching most river and stream crossings at this time, based on an economic evaluation of trenching versus boring. All ditches would be excavated to the depth necessary to minimize the scouring of the pipeline cover during periods of high flow. The minimum cover would be the maximum scour depth plus 4.5 ft. During construction of river crossings, the drainage or storm runoff from major riverbank staging areas would be controlled with detention basins, evaporation ponds, or straw bale filters to prevent discharge of suspended solids.

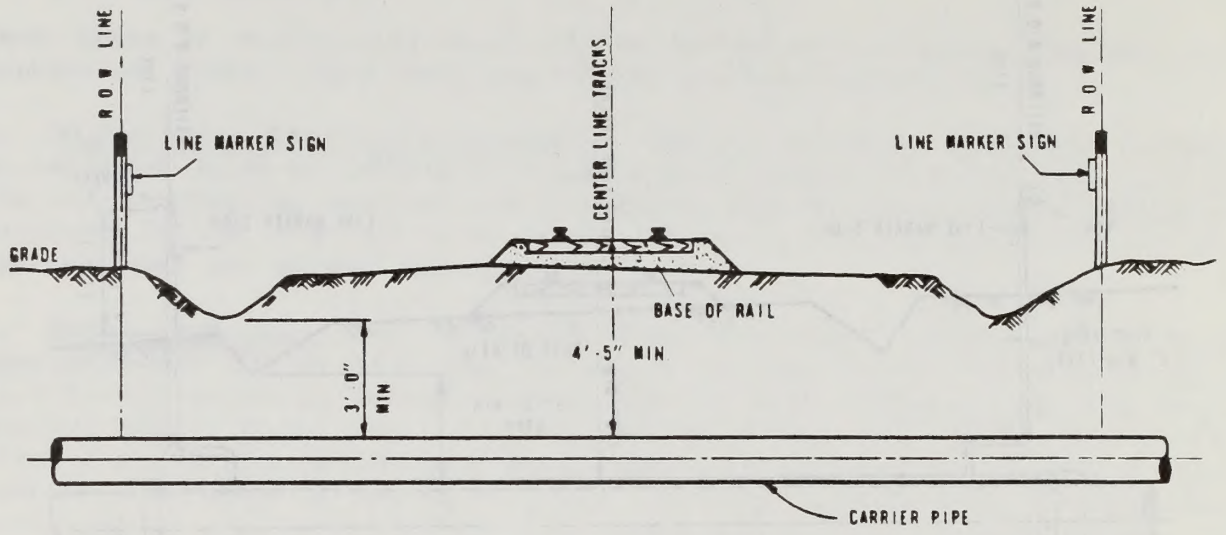


RAILROAD CROSSING

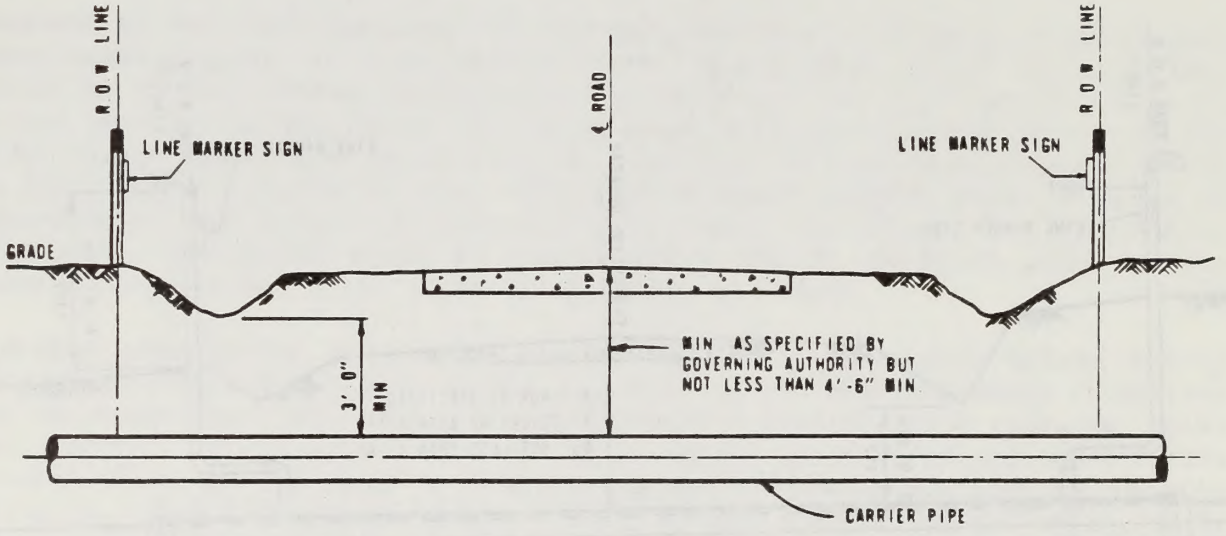


HIGHWAY CROSSING

Figure 2.2.5-3 - Cased Crossing (typical, not to scale)
(Pactex, 1985)

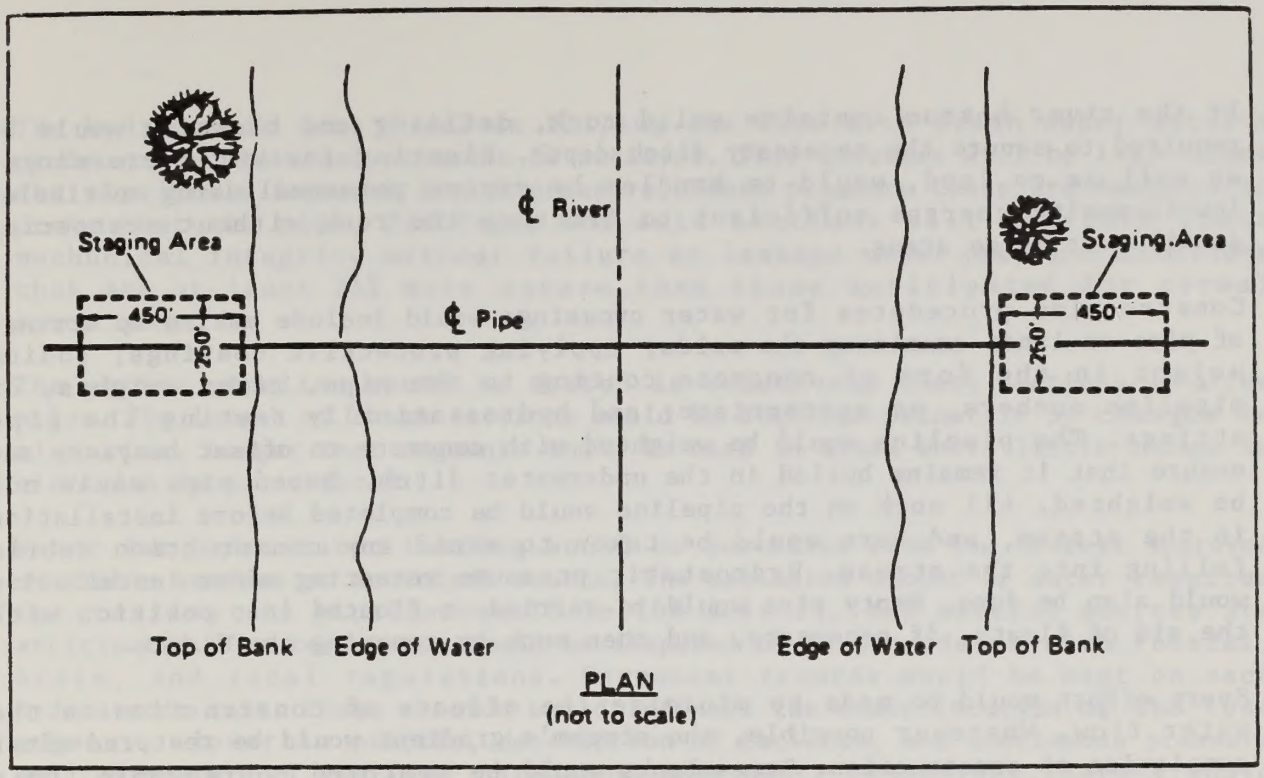


RAILROAD CROSSING



HIGHWAY CROSSING

Figure 2.2.5-4 - Uncased Crossing (typical, not to scale)
(Pactex, 1985)



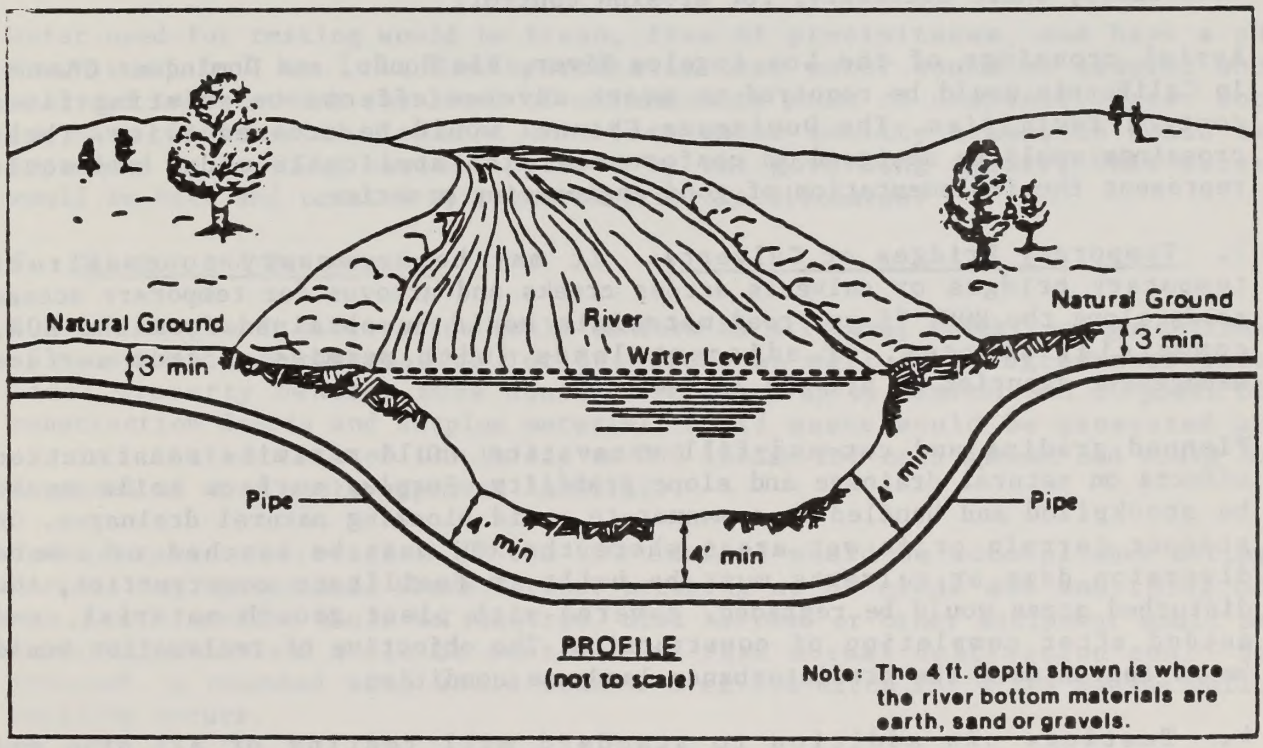


Figure 2.2.5-5 - Typical River Crossing (plan and profile, not to scale) (Pactex, 1985)

If the river bottom contains solid rock, drilling and blasting would be required to secure the necessary ditch depth. Blasting for water crossings, as well as on land, would be handled by expert personnel using multiholed low-intensity charges sufficient to fracture the rock without scattering debris over large areas.

Construction procedures for water crossings would include making up strings of pipe on land; examining the welds; applying protective coatings; adding weight in the form of concrete coating to the pipe, river weights, or pipeline anchors, as appropriate; and hydrostatically testing the pipe strings. The pipeline would be weighted with concrete to offset buoyancy and ensure that it remains buried in the underwater ditch. Bored pipe would not be weighted. All work on the pipeline would be completed before installation in the stream, and care would be taken to avoid any construction debris falling into the stream. Hydrostatic pressure retesting after installation would also be done. Empty pipe would be carried or floated into position with the aid of floats, if necessary, and then sunk by removing the floats.

Every effort would be made to minimize the effects of construction on the water flow. Wherever possible, the stream's gradient would be restored after completion of construction. Streambanks would be restored to resemble their original grade, and riprap would be placed over the pipeline along riverbanks, where necessary, for erosion control.

Aerial crossings of the Los Angeles River, Rio Hondo, and Dominquez Channel in California would be required to avert adverse effects to existing flood control facilities. The Dominquez Channel would be crossed twice. These crossings would be designed in conformance with applicable codes and would represent the implementation of good engineering practice.

3. Temporary Bridges or Culverts. It may be necessary to construct temporary bridges or culverts across creeks and arroyos for temporary access roads along the ROW. If so, road materials would be obtained from the ROW, commercial sources, or adjacent lands (with permission from surface management agencies or private landowners).

Planned grading and cut-and-fill excavation would minimize construction effects on natural drainage and slope stability. Surplus surface soils would be stockpiled and handled in a manner to avoid blocking natural drainages. On steeper terrain or in wet areas where the ROW must be benched or where diversion dams or culverts must be built to facilitate construction, the disturbed areas would be regraded, covered with plant growth material, and seeded after completion of construction. The objective of reclamation would be to approximate the predisturbance land-use condition.

4. Testing. In addition to standard mill testing of all pipe and fittings, hydrostatic testing would be performed after construction and before the line is placed in crude oil service. Mill testing includes nondestructive testing by one or more of the following methods: radiographic, ultrasonic, electromagnetic, or hydrostatic. The hydrostatic test would be conducted in accordance with requirements of the Code of Federal Regulations, Part 195, Title 95; ANSI B31.4 (Liquid Petroleum Transportation Piping Systems) and applicable state/local regulations.

The hydrostatic test involves filling the line with fresh water until a predetermined internal pressure is achieved. This pressure will be 1.25 times the pipeline's internal design pressure. These pressure tests are designed to prove that the pipe, fittings, and weld sections will maintain their mechanical integrity without failure or leakage under pressure conditions that are at least 25% more severe than those anticipated for normal operation.

The entire pipeline would be tested in relatively short sections of a few miles. The length of these sections would be dictated primarily by changes in elevation. Longer test segments would be used in areas where little change in elevation is encountered.

Water for hydrostatic testing would be purchased from the nearest approved available surface or municipal source. The estimated amount of water required for testing the pipeline would be 168 acre-ft, and several sources are anticipated. The test water would be disposed of in accordance with Federal, state, and local regulations. Permanent records would be kept on each hydrostatic test. These records would indicate the exact location of the test segment, elevation profile, description of facility, and continuous pressure and temperature of the line throughout the test. Deadweight testers would verify the accuracy of the pressure during the test.

Water used for testing would be fresh, free of precipitates, and have a pH factor of 6.7 to 7.2. The hydrostatic test water would be sampled and analyzed to determine the level of contaminants prior to disposal. Water not in compliance with Federal or state water quality standards would be impounded in holding basins approved by the governing agency. This water would be held and treated as required prior to discharge.

C. Cleanup and Restoration

ROW cleanup and restoration would conform to all laws, rules, and guidelines of government agencies having jurisdiction, as well as to agreements with local property owners. ROWs would be cleaned up by removal and disposal of construction debris and surplus material. Solid waste would be generated at an anticipated rate of 100 lb/day to 200 lb/day for each spread and would be disposed of at a state-approved landfill.

Considerable restoration of the ROW surface would be accomplished during backfilling operations. Where further breaking up of clods and smoothing of the earth surface would be required, disk harrows or other equipment would be used. Tillable land would be restored so that normal cultivation could be resumed. A rounded hump would remain over the ditch for a few months while settling occurs.

Temporary openings in fences would be removed and replaced with gates or restored to their original conditions. Markers showing exact locations of pipelines would be installed at road and fence crossings. Markers would identify owners of the pipeline and would contain such other information as the type of material transported and the location and telephone number of the owner to be contacted in case of emergency.

From this point in the cleanup and restoration operation, each treatment would be specific to given segments along the ROW. The following considerations may be applied in determining the restoration procedure:

(1) Restoration crews would attempt to return the disturbed areas to those conditions existing before construction, where this does not interfere with the primary functions of the ROW.

(2) Land-use plans may allow for, or require, that the restored areas exhibit characteristics different from the preconstruction conditions. On public land, all appropriate regulations, guidelines, permit stipulations, and ROW grant provisions would be followed. The landowners will determine restoration needs for privately owned lands.

(3) Several approaches to restoration would be available. These may be used separately or in various combinations. The choice would depend on the considerations listed above. The most commonly available approaches include:

(a) Surface contouring
(b) Surface cultivation
(c) Mulch application
(d) Chemical treatments for erosion control
(e) Seeding/replanting

The nature of the land being crossed will determine which of the restoration approaches mentioned above would be used. The choice of the approach would be subject to the following modifications.

1. All Land-Use Types. Restoration would follow pipeline construction specifications, usually beginning with the disposal of debris, the restoration of normal contour, and the conditioning of surface soils. Surface contouring/terracing and certain structures may be used as diversions to concentrate and/or channel the surface waterflow. Where appropriate, topsoil may be returned to cover the trench backfill material.

2. Barren Lands. Mulching may be practiced, where appropriate, to prepare seedbeds and control erosion. Fertilizers may be applied. Spray-on adhesives may be used for the stabilization of critical areas. Where rainfall is minimal, revegetation may not be practical and may not be required.

3. Forest and Woodland. Mulching may be practiced, where appropriate, to prepare seedbeds and control erosion. Fertilizers and spray-on adhesives may be used on local sites.

4. Improved Pasture and Cultivatable Lands. Restorations would be based on preconstruction agreements with the landowner.

5. ROW. Restoration may be modified when coincident with or crossing other ROWs. Where electric transmission line ROWs are encountered, restoration programs would conform to those for the land-use type on which

the encounter occurs, to those of the preexisting ROW, or to a program agreed to with the holder of the preexisting ROW, as appropriate. The crossing of certain minor roads may be accomplished by trenching. In such cases, restoration of both the road margins and of the roadway itself would conform to the laws, regulations, and guidelines of the government agency having jurisdiction or to the needs of the owner, as appropriate.

6. Streams. Restoration of the ROW where it crosses a stream would emphasize streambank stabilization, which may involve mulches, spray-on adhesives, and/or revetment structures.

7. Ancillary Facilities. Pump stations, permanent access roads, and valve stations would be restored to ensure soil stabilization and minimal landscape changes. Each case would be treated based on both the characteristics and operational needs of the site.

8. Temporary Support Facilities. Temporary access roads, staging and assembly areas, and other temporary installation support areas would be restored. These areas would be stabilized without undue delay, and the land would be returned to the original owner or land manager.

2.2.6 PUMP STATIONS

Five pump stations would be constructed initially. The remaining six pump stations would be constructed over an 18-month period, following startup. The initial construction phase of a pump station includes site clearing and grading, as well as establishing necessary security. A 50-person crew is estimated for construction of each pump station. The task of welding and installing pipe, fittings, and other material would begin after completion of grading. Foundations for the electrical substation and pumps would be poured, as would any additional concrete work. Powerlines from the local electric utility would also be routed into the electrical substation at this time. Areas around the pump station may be bermed and planted to reduce visibility and noise. A typical pump station would require an approximately 4- to 6-month construction period.

The access road and utility tap lengths are listed in Table 2.2.1-4.

2.2.7 MIDLAND TERMINAL

A. Civil Construction

Construction of this facility would include site clearing and grading, tank foundations, erection of tanks, dikes, and roadways. Clearing and grading would remove vegetation, as required, and would provide suitable site drainage to permit construction. Sufficient earthen material would be made available on the site to construct tank dikes. Select granular fill for foundations and roadbeds would be hauled from the surrounding areas capable of producing the type and quantity of material required.

B. Tank Erection

The erection of the storage tanks would be carried out in the same manner as described for the terminal facilities at POLA (subsection 2.2.4). The overall duration of tank erection would be required to coincide with the completion of the pipeline construction.

C. Mechanical/Electrical Construction

The mechanical/electrical construction at Midland would proceed as described for the terminal at POLA.

2.2.8 OPERATIONS AND MAINTENANCE PHASE

Operation of the Pactex pipeline system would be in compliance with all applicable USCG, COE, BLM, FS, DOT, state, LAHD, and local regulations and standards. Pump station facilities for the pipeline system would be designed for unattended operation and controlled remotely from a main control center in Los Angeles where dispatching personnel would start and stop equipment, open and close valves, control flow rates, and monitor all operations.

A. POLA Terminal

1. Crude Oil Offloading. The facilities would include four remote-controlled loading arms per berth having a rated capacity of up to 28,000 bph each and a metering facility. The metering facility would be on the proposed landfill island.

2. Fire Protection. Systems for fire protection would include hydrants and monitors, water deluge systems, foam-flooding systems, and detection/alarm systems. Monitors would be used to direct water or foam on the platform and loading arm connections. Deluge systems would be used for platform and trestle cooling in the event of a fire below these structures. Individual foam-flooding systems would be used to protect the critical offloading, pumping, and metering areas. Detection devices may be heat sensors, infrared (flame detection), and gas detector types, as applicable. Water for fire protection would be saltwater using sea intake(s) and dual engine-driven fire pumps to supply water. The water quantity and pressure would be agreed to with the fire authorities. Systems would be designed according to NFPA standards and fire department regulations. The specific details of the fire protection systems are currently being developed by Pactex in consultation with the LAFD.

3. Sanitary Facilities. The toilet room would require freshwater to be barged from shore, and sewage would be held for barge pickup and disposal at intervals. At 20 gpm per capita per day for 12 employees, daily water usage (and approximate sewage generated) would be 240 gallons. Minimum storage and holding tank sizes for weekly service intervals would be 5,000 gallons. A booster pump and hydropneumatic tank would be used for freshwater supply. Sanitary facilities would be provided for terminal employees only; it is assumed that shipboard facilities would remain active and could supply water and sewage holding during transfer periods.

4. Water Pollution Control. Water pollution would be alleviated by:

(1) Curbing and containing all spillage and stormwater on the loading platform and in the metering area.

(2) A system to move contaminants from the loading platform to the oil/water separator.

(3) A gravity and coalescing-type oil/water separator on the proposed landfill island that is capable of treating the above, plus all island storm drainage when necessary. Water meeting NPDES standards would be discharged; liquids not meeting standards would be held for barging off the island for proper disposal.

(4) Spill boom and deployment equipment for use during transfer operations.

(5) A permanent water treatment facility to treat the wastewater to a suitable quality for discharge, which would be based on applicable discharge standards. Solids from the water treatment plant and from stack cleaning would be disposed of at a permitted landfill site. The use of biocides or scaling agents is not anticipated in the tanker emission control system.

5. Electrical Systems at POLA Terminal. Electrical systems at the POLA terminal would include:

(1) Main Service. A main service would be provided to handle the power requirements of the island area lighting, capstan motors, transfer platforms, berthing and mooring dolphins, metering station, control building, saltwater pump building, and pollution control equipment.

(2) Power Source. Power source from the Los Angeles Department of Water and Power (LADWP) is available at Terminal Island. Submarine cables would be used and installed to bring electricity to the proposed landfill island.

(3) Lighting System. The indoor lighting system would use fixtures with fluorescent lamps, and the outdoor lighting system would use fixtures with high-pressure sodium lamps. Area lighting fixtures would be controlled by photoelectricity and a timer. Navigation lights would be provided as required by POLA and/or USCG.

(4) Emergency Power. An uninterruptible power source (UPS) would be provided to supply power to the computer and communication systems. An emergency generator would be provided for lighting and main power.

(5) Fire Protection Systems. Because fire pumps would be driven by diesel engine, no electric source is required. The fire alarm system would be provided with pull stations installed throughout the area. A fully instrumented fire detection system would be provided by

specialists in this field. The system design is being coordinated with firefighting authorities. Diesel fuel would be stored in a storage tank with approximately 100-barrel capacity.

(6) Cathodic Protection. A cathodic protection system would be provided on all steel structures used on the berthing areas and within the terminal.

B. Communication and Control System

The pipeline system would be controlled through an existing microwave communication system. Each pump station, maintenance base, and terminal would be equipped with an antenna for transmission of data and receipt of remote control operating instructions. This system would include voice circuits, as required, for point-to-point communication during O&M. Mobile very high frequency (VHF) radio voice communication would supplement the point-to-point system to provide communication with crews maintaining the pipeline in remote areas. Marine radio would be provided for coordination with ships calling at the berths.

The pipeline design would include a supervisory control and surveillance system to provide 24-hour remote control and operations monitoring. The system would be comprised of a master station having standby equipment and would be an all-solid-state, digital, continuously scanning type that automatically scans or interrogates one or more remote terminal unit (RTU) groups in sequence.

Data collected would include equipment alarm and status information along with transmitted values for pressures, temperatures, flow rates, accumulated meter readings, tank levels, leak detection, vibration, and other operating information to ensure safe and efficient operations. A computerized event logger would record each operational event chronologically, and a computerized information logger would record all operations reports as required. The master station would include an integrally programmed leak-detection system designed to adjust for variations in operating pressures and short-term changes in the flow rate in and out of the pipeline.

Three methods of leak detection would be used by Pactex:

(1) Pressure deviation
(2) Flow rate deviation
(3) Volumetric imbalance

All of these methods are effective in the detection of a large break such as might be experienced if an earthmoving machine punctured the pipeline. These large leaks could be detected rapidly with a high degree of certainty. The volumetric imbalance method is also effective in the detection of small leaks. The short-term leak detection threshold would be approximately 36 barrels on a 6-minute time basis and 450 barrels on a 12-hour time basis. The pipeline dispatcher would evaluate the situation immediately and, at his discretion, would shut down the pipeline. The maintenance crew would

implement established procedures to locate and repair the leak and would notify appropriate authorities. A detailed procedure would be outlined in the Oil Spill Contingency Plan.

The pipeline communications system would ensure the transmission of information required for the safe O&M of the pipeline. The system would provide the various communications channels required for transmission of supervisory control, as well as surveillance data and voice communications. The control system would also be tied into the fire detection system.

Pumping stations would be equipped with protective devices to monitor the operation of the entire station and the individual pumping units to ensure safe operation and protect the equipment from damage. The station controls would be designed for unattended fail-safe operation, although remote control of a station would continue to run as long as its operation remained consistent with all of its preset limits for pressure, temperature, flow, etc.

C. Maintenance Stations

Pipeline and pump station repair specialists would be based at the main control station in Los Angeles, the Midland terminal, and at intermediate sites in Casa Grande, Arizona, and Deming, New Mexico, located on existing industrial-zoned property. Each base would be responsible for specifically assigned segments of the pipeline, in addition to the pump stations included in those segments. Each of the four maintenance bases would be equipped with specialized equipment, tools, spare parts, and repair materials to handle routine maintenance, as well as any emergency condition. Each station would have a local maintenance staff residing in the vicinity to perform minor and routine maintenance and to be on call to handle emergencies until others were able to arrive at the scene.

Aerial reconnaissance of the entire pipeline ROW would be conducted at least every 2 weeks (DOT regulations) to detect small leaks that might not show up on the pipeline monitoring equipment and to monitor the success of erosion control and revegetation. The pilot making the reconnaissance would immediately report any observed activity or abnormal condition to the nearest maintenance center. The purpose of all monitoring activities would be to identify problem areas quickly so that mitigative measures might be taken to correct any problem.

Access roads to the pump stations would be maintained to provide access for maintenance personnel at all times. The permanent ROW would be the major access to the pipeline. Pipeline block valves would be protected with fences and locked gates. The valves would also be locked independently to prevent unauthorized operation. Block valve sites would be kept clear of woody vegetation. If road access to pump stations or block valves is prevented due to extremely wet roads or other conditions, as specified by the land-managing agency, routine and emergency access would be provided by helicopter.

D. Oil Spills

An Oil Spill Contingency Plan and Spill Prevention Control and Countermeasure Plan would provide for operational districts that would be associated with the designated maintenance centers at the berth, terminal facilities, and along the pipeline route. The plans would provide information on oil spill response techniques, cleanup and containment equipment, and procedures to be followed. These plans must be approved by the POLA Port Warden, the EPA, and authorities of the respective states prior to system startup. Appendix G summarizes the format and content for the required plans.

E. Manpower

The general Pactex philosophy of operation is that most of the O&M personnel will be located in a few principal locations. The executive and administration staff would be headquartered in an office building in the metropolitan Los Angeles area. The maintenance staff in the Los Angeles area would be working from garage-like existing buildings leased for that purpose. The Midland personnel would be in an office and maintenance building on the Midland terminal property.

1. Headquarters Office. It is anticipated that an office would be established in an existing or new office building in the Los Angeles metropolitan area. The executive and administrative function of the company would be carried out in that office, as well as certain portions of the O&M management. A staff of 49 would be required. When the engineering details are determined, a separate environmental assessment for the headquarters office will be conducted.

2. Maintenance Staff. In addition to the Los Angeles and Midland maintenance bases, other maintenance bases would be established in Casa Grande, Arizona, and Deming, New Mexico. These bases would be located in the industrial areas and should have good access by highway to the pumping stations and pipeline systems to the extent that is practical. These bases would require 11 persons each.

In addition, contractors would be under agreement to provide men and equipment for maintenance work both within the stations and terminals and along the main pipeline. These contractors would require, on the average, an additional total of 40 persons in the four locations.

3. Pumping Stations. All pumping stations have been assumed to be unattended and remotely controlled by the dispatchers in the headquarters office. Stations would have someone living in the vicinity of the station who would do routine maintenance on a daily basis at that station and would be available to assist in the general maintenance at other locations or on the pipeline. This would require a total of 11 persons located about 90 miles apart on the average.

4. POLA. The staff assigned to the tanker-offloading operations would work at that site. Six around-the-clock shift persons would be planned, plus a senior supervisor for a total staff of 31. The nearby terminal would have

three around-the-clock shift persons, a supervisor, and a building maintenance person for a total of 17, or 48 for both facilities. Normally, the maximum number of persons at these sites in POLA would be 12.

5. O&M Personnel. The O&M personnel requirements are summarized in Table 2.2.8-1.

2.2.9 ABANDONMENT

The project life of the pipeline system would depend on the availability of crude oil. If additional supplies should become available, the life of the facilities and/or their capacities could be extended beyond the projected 30- to 50-year life of the project. Insufficient availability of crude oil or other economic situations could make operation of the pipeline system infeasible beyond the 30- to 50-year project life and could result in the abandonment and disposal of all or portions of the system. The abandonment procedures used would be subject to appropriate existing local, state, and Federal regulations in effect at that time. The berthing and terminal facilities at POLA would return to the control of LAHD after the restoration conditions of the lease agreement were complied with. Noncapital facilities would be removed, or LAHD could accept ownership in lieu of restoration.

Table 2.2.8-1 - Summary of Estimated O&M Personnel

Function	Work Location	No. of Persons
Headquarters	Los Angeles office	49
Dock and Terminal	Landfill island	48
Los Angeles Maintenance	Los Angeles area industrial building	11
Los Angeles Contractor	Los Angeles area	19
Pump Station Residents	11 stations	11
Casa Grande Maintenance	Casa Grande, Arizona	11
Case Grande Contractor	Casa Grande area	6
Deming Maintenance	Deming, New Mexico	11
Deming Contractor	Deming area	6
Midland Terminal	Midland, Texas	21
Midland Contractor	Midland area	9
Total		202

Source: Pactex, 1985.

Crude oil remaining in the system would be drained to the tank farms. Removal of the crude oil from the pipeline would be accomplished by displacing it with water obtained from existing sources along the route. Water would be delivered to oil/water separators before discharge. Discharged water would meet Federal and state water quality standards. Equipment would be disconnected, sealed, secured, and possibly removed for salvage. Storage tanks at the tank farms would be dismantled and salvaged.

If warranted by salvage value, pipe would be removed; otherwise, it would be abandoned in place. Removing and salvaging pipe and valves would be similar to construction activities but with a simplified work scope. Some sections of pipeline such as river or road crossings would not be removed. The ends of the pipeline on both sides of such a crossing would be sealed, covered with soil, and the ROW restored. If it were not economically feasible to salvage the pipeline, it would be purged of petroleum and filled with an inert substance such as nitrogen gas or water. The pipeline cathodic protection system would be disconnected and removed.

Machine pumps and motors would be disconnected and either stored or removed for other uses. Before the pump stations were abandoned, all oil would be evacuated and equipment would be salvaged or disposed of. Any support facility used in the abandonment procedure would be taken out of service, sold, or salvaged. These facilities include maintenance, communication, fire protection, oil cleanup, and electrical support equipment. Unsalvageable material such as concrete would be disposed of at authorized sites. All disturbed areas would be regraded and revegetated, where practical. Additional backfill might be required to restore the ROW to its original condition. The abandoned ROW would revert to the private landowner or agency control. Land management agencies could place special conditions on abandonment if deemed necessary.

2.3 PROJECT ALTERNATIVES

The proposed Pactex project discussed in subsection 2.2 would combine tanker transport from Alaska, California, and Pacific rim countries to berthing/terminal facilities in POLA and crude oil transport via pipeline facilities to Midland, Texas. This proposal has been selected by Pactex because it meets objectives for the project, is cost-effective and timely, and would provide secure delivery of surplus Alaska, OCS, and Pacific rim crude oil to central U.S. markets.

Alternatives to the Pactex project are addressed here and in subsection 2.4. These alternatives include two landfill component alternatives:

(1) Dredge the channel to -70 ft with concomitant creation of a 96-acre landfill.

(2) Dredge the channel to -75 ft and construct a fully diked 170-acre landfill island.

Also included is a Coachella Valley pipeline routing component alternative to avoid passage through the proposed Coachella Valley Fringe-toed Lizard Preserve.

The four project alternatives that were considered but found infeasible are discussed in subsection 2.4.1:

(1) SOHIO West Coast to Mid-Continent Pipeline Project
(2) Northern Tier Pipeline Project
(3) Six other pipeline systems evaluated in BLM (1976)
(4) Alternative transportation modes

Several types of alternatives considered but eliminated from detailed analysis are discussed in subsection 2.4.2:

(1) Alternative sites for oil storage in the POLA area

    (a) Manville Property, City of Carson
    (b) 190-acre landfill
    (c) Additional area near Wilmington Liquid Bulk Tank Farm
    (d) Anchorage Road area
    (e) Floating terminal facility

(2) Alternative berthing locations in San Pedro Bay

    (a) Pier J
    (b) Navy Mole area
    (c) Vicinity of Anchorage C-5 (Long Beach outer harbor)
    (d) 190-acre landfill

(3) Minimum facilities alternatives

    (a) Minimum project
    (b) Minimum landfill for terminal in Los Angeles Harbor
    (c) Channel landfill/terminal area outside breakwater
    (d) Single-point mooring

(4) Pipeline component alternatives

    (a) Celeron/All-American Pipeline Project
    (b) Arco Four Corners Pipeline

(5) Other alternative: electric pumps for tanker offloading

The SOHIO West Coast to Mid-Continent Pipeline Project EIR (BLM, 1976) assessed the impact of 55 alternatives for transporting Alaska crude oil to the central United States, including 21 Pacific coast points of entry. That EIR is incorporated by reference. (It can be viewed at depositories listed in Section 5, Table 5.2) The basic conclusion of the SOHIO EIR was that no single system of marine or marine and pipeline routes was preferable to the SOHIO project in all areas.

The proposed pipeline to Midland would have some adverse impacts over portions of its corridor; however, by comparison with other corridors identified and assessed in the SOHIO EIR, the impact of the proposed SOHIO (Pactex) corridor would be low. An overview of the infeasibility of alternatives addressed in that EIR is provided in subsection 2.4. After eliminating the other Pacific coast points of entry, the only alternative project considered in detail to the Pactex proposal is the no-project (no-action) alternative (subsection 2.3.1).

A comparison of environmental impacts, objectives, and costs is provided in subsection 2.5 for the Pactex proposal versus the no-project alternative, the proposed landfill island versus the two landfill component alternatives, and the Pactex proposal versus the Coachella Valley pipeline routing component alternative.

2.3.1 NO-PROJECT (NO-ACTION) ALTERNATIVE

If the Pactex project proposal is not implemented, oil would continue to be shipped from Alaska by marine tanker to Panama. Currently, surplus west coast crude oil is transported to refineries on the gulf coast and east coast by way of Panama. Most tankers are too large for the locks of the Panama Canal and must offload to smaller tankers, which then traverse the canal or use the Trans-Panama pipeline. This alternative would maintain existing levels of shipments from Pacific rim countries and other PADD V districts, as well as intrastate shipments of California-produced oil. This alternative does not require the construction of an offshore marine island, tank storage facilities, or associated pipeline for transport to Texas.

Federal legislation dictates that Alaska crude oil must be shipped only to U.S. ports for U.S. refining and that transport is subject to the Jones Act requirements (TAPS Authorizing Act, 43 USC 1652; Energy Policy and Conservation Act, 42 USC 6212; and Export Administration Act of 1979, 50 USC APP 2406). Therefore, there is no major market for Alaska oil that is surplus on the west coast.

2.3.2 LANDFILL CONFIGURATION ALTERNATIVES

A. Alternative 1: 96-Acre Landfill Island and -70-ft Depth Dredged

This alternative (Figure 2.3-1) is a 96-acre island in POLA constructed with dredged material from the channel, berthing area, and turning basin dredged to -70 ft MLLW. The location of the south and east boundaries of the island and the terminal, as well as metering facilities on the island, would remain identical to the Pactex proposal. The 11 million yd^3 of dredge material (compared 15 million yd^3) would reduce the surface landfill island area by 17% (115 acres to 96 acres) and would reduce the total affected benthic area from 208 acres to 183 acres. The alternative of -70-ft MLLW channel elevation is feasible when limiting the tanker class to 209,000 dwt or when larger ships call on the port under partial loads. The tank farm setback distance from the berths would be reduced by 400 ft in comparison to the proposed landfill project.

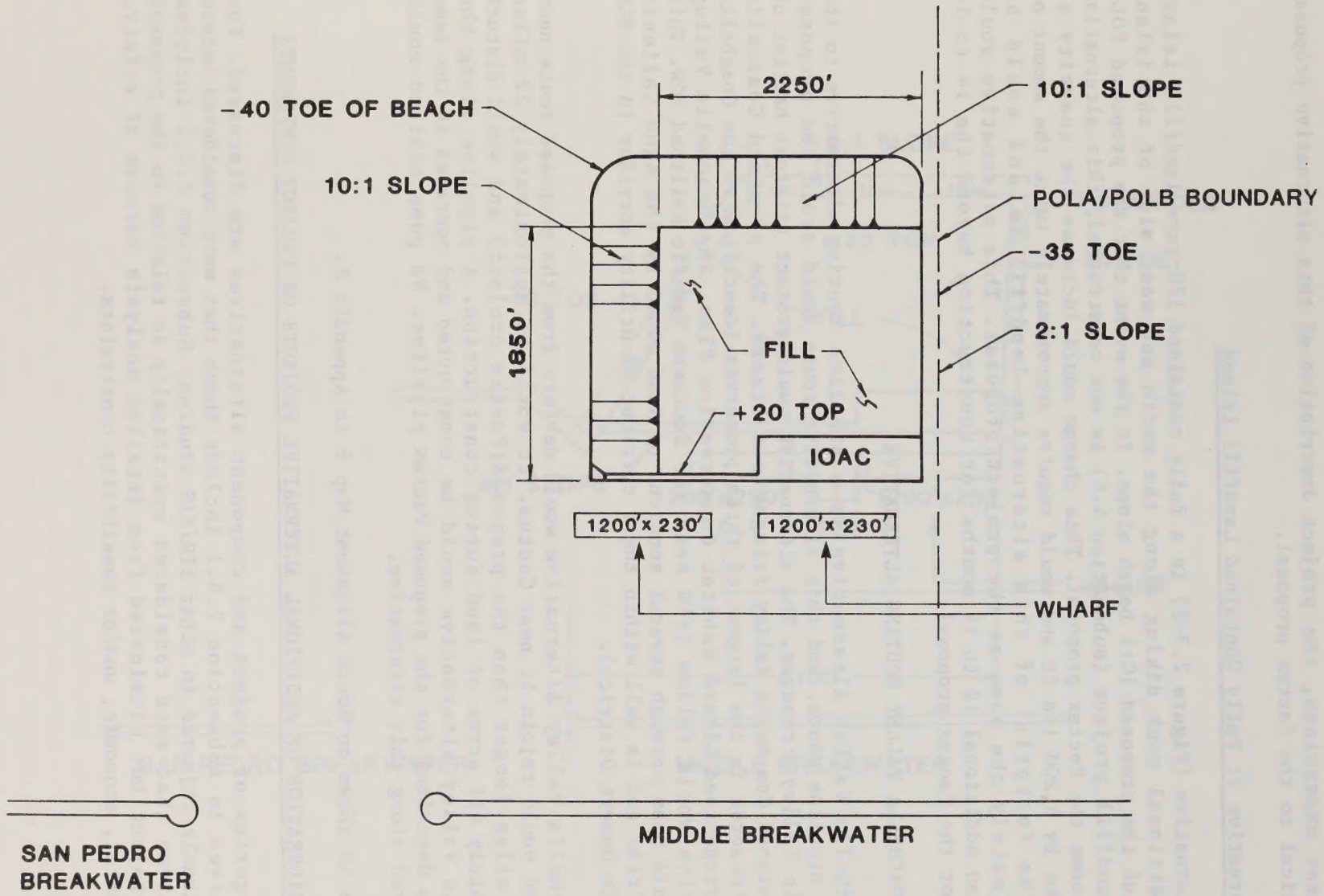


Figure 2.3-1 - Landfill Alternative 1: 96-Acre Landfill, -70-ft Dredge Depth (Pactex, 1985) (not to sacle)

With these exceptions, the project description of this alternative proposal is identical to the Pactex proposal.

B. Alternative 2: Fully Contained Landfill Island

This alternative (Figure 2.3-2) is a fully contained 170-acre landfill island with additional rock diking along the north and west side of the island instead of the proposed 10:1 beach slope. In the event that the proposed POLA South Landfill project (subsection 4.6) is not constructed, this alternative would become the Pactex proposal. This change would increase the quantity of rock dike by 6,200 lin ft and would require approximately twice the amount of rock. The footprint of this alternative landfill island would be approximately the same as the project proposal. This alternative would require an additional 12 to 14 months for construction beyond the 14 to 16 months for the Pactex proposal.

2.3.3 COACHELLA VALLEY ROUTING ALTERNATIVE

The Coachella Valley Alternative is a pipeline routing alternative to the proposed pipeline route, and this alternative route would avoid the proposed Coachella Valley Preserve. The alternative would protect critical habitat of the threatened Coachella Valley fringe-toed lizard. The proposed Coachella Valley Preserve is the largest of three preserves identified in the Coachella Valley Fringe-toed Lizard Habitat Conservation Plan. The Coachella Valley Alternative would follow I-10 near the Southern Pacific Railroad ROW. This route would pass through several sections of land owned by the Agua Caliente Indian Tribe and is well within the K corridor (a utility corridor in the BLM California Desert District).

The Coachella Valley Alternative would deviate from the proposed route near Garnet and would rejoin it near Cactus. It would be approximately 22 miles long (2 miles longer than the proposed Pactex project) and would disturb approximately 411 acres of land during construction. A pipeline along the Coachella Valley Alternative would be constructed and operated in the same manner as described for the proposed Pactex pipeline. No pump station would be required along this alternative.

The route is shown on Route Alignment Map 3 in Appendix J.

2.4 CONSIDERATION OF ADDITIONAL ALTERNATIVE PROJECTS OR PROJECT COMPONENTS

Two categories of project and component alternatives are discussed. The alternatives in subsection 2.4.1 include those that were considered before but previously rejected in other EIR/EIS studies. Subsection 2.4.2 includes alternatives that were considered specifically in relation to the proposed Pactex project but eliminated from detailed analysis because of safety, environmental, economic, and/or feasibility constraints.

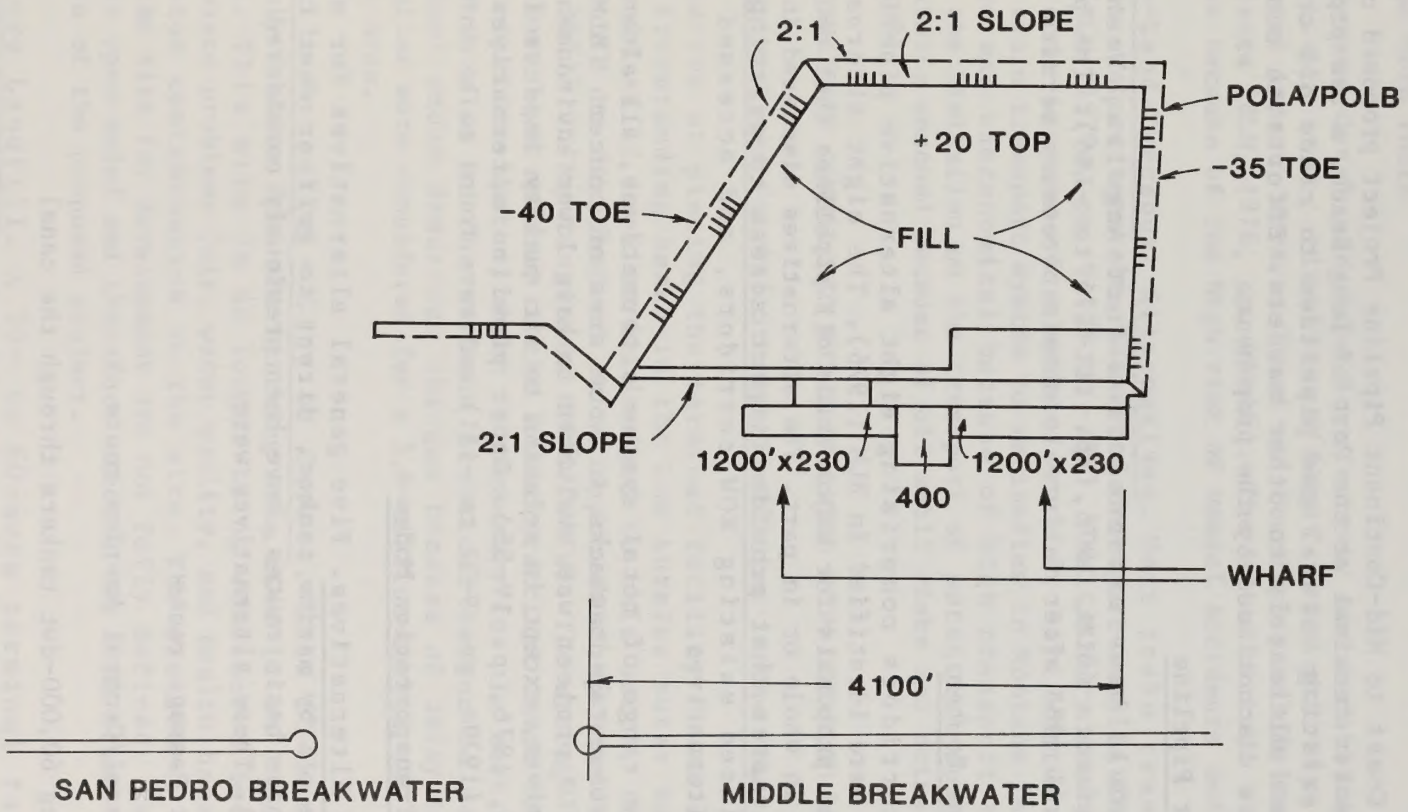


Figure 2.3-2 - Landfill Alternative 2: Fully Diked
170-Acre Landfill (Pactex, 1985) (not to scale)

2.4.1 ALTERNATIVES CONSIDERED BEFORE BUT PREVIOUSLY REJECTED

A. SOHIO West Coast to Mid-Continent Pipeline Project

The SOHIO West Coast to Mid-Continent Pipeline Project proposed construction of a crude oil tanker terminal at the Port of Long Beach, a new pipeline, and conversion of existing natural gas pipelines to crude oil transport to Midland, Texas, and ultimately to other markets. Efforts to construct the SOHIO project were discontinued by the proponent.

B. Northern Tier Pipeline

This project would have extended from Port Angeles, Washington, to Clearbrooke, Minnesota (BLM, 1976, pp. III-176 to -186). The project was abandoned in April 1983 after failure to obtain necessary permits during 1977 to 1983.

C. Other Pipeline Routes

Six pipeline corridors comprising eight alternative pipeline systems including SOHIO, were identified in BLM (1976). The eight alternatives were drawn from actual proposals for major crude oil pipelines that could meet the SOHIO objectives in whole or in part. The alternatives discussed in the SOHIO FEIS included routes that provided direct access to existing crude oil pipelines, utilized existing ROW corridors, and accessed potential point-of-entry alternatives.

Among the entire range of total system alternatives, all alternatives had significant environmental drawbacks in some area of concern (BLM, 1976, p. IV-55). The SOHIO project was evaluated to have lower environmental impacts than all alternatives, except in relation to air quality impacts in the Long Beach area (BLM, 1976, p. IV-55). Other pipeline alternatives have been discussed in BLM (1979a, pp. 9-31 to -151) and were found to be infeasible.

D. Alternative Transportation Modes

1. All-Marine Alternatives. Five general alternatives for shipment of North Slope crude oil by marine tanker, direct to gulf or east coast ports and involving three basic routes, have been previously considered (BLM, 1976, pp. IV-45 to -46). These alternatives were:

   (1) Northwest Passage route

   (2) Panama Canal/Central America route

      (a) Using 60,000-dwt tankers through the canal

      (b) Using 165,000-dwt tankers or larger on the Pacific leg and transshipping at Balboa to 60,000-dwt tankers for use through the Panama Canal and the gulf

(c) Transshipping across Central America by pipeline, using 165,000-dwt tankers or larger on both marine legs

(3) Cape Horn route

Only the Panama Canal and Cape Horn routes are established seaways. Four factors, i.e., cost, timeliness/fleet availability, security, and environmental impact, were analyzed and found to preclude the alternatives as viable projects (BLM, 1976, pp. 45-46). The alternatives were specifically unattractive because of the high risk of vessel accidents and oil spills.

2. Marine-Land Transport Alternatives. Unit train transport has been proposed as a short-term alternative to transport surplus flow of North Slope crude oil (BLM, 1979a, pp. 9-158 to -159). Preliminary analysis carried out to assess some impacts of a marine entry at Port Westward, Oregon, with associated train transport system to refineries in Montana indicated that the alternative was uneconomical because of high transport costs, infeasible because of the limitation on the transport of potential surplus volume, and environmentally unsound because of oil spill risks and noise (BLM, 1979a, pp. 9-158 to -159).

2.4.2 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

A. Alternative Sites for Oil Storage Facilities in the POLA Area

The alternative of placing the terminal facility on an existing landmass assumes a freestanding berth in the Los Angeles outer harbor. Because a channel would still have to be dredged to this berth, the excess dredge material would be disposed of at an approved dump site off Point Fermin (latitude 33°37'06"N, longitude 118°17'24"W). The storage requirements near the berths have been reduced to the lowest practical level for a continuously operating pipeline system, which is necessary for the most efficient system. The storage is also at the minimum practical amount to receive the large ships without undue demurrage charges because of delay in offloading. The following sites were considered for a 5.6-million-barrel oil storage facility in the POLA area.

1. Manville Property - City of Carson. This 65-acre site located approximately 6 miles from the berthing area lies in an industrialized area of Carson. This site is no longer being considered because of certain hazardous waste problems (air, water quality, and health hazards) associated with asbestos contamination at the site. The procedures to be followed in preparing the site for development are not fully defined. As such, the time required is open-ended and therefore exceeds the time frame reference for the requirements of the proposed project.

2. 190-Acre Landfill. A 50- to 60-acre terminal facility could be constructed along the east boundary of the recently created 190-acre landfill. This alternative is consistent with the POLA's certified master plan of land usage, but on analysis of the hazardous footprint (Port of Los Angeles, 1983) several vulnerable resources would have been impacted (i.e., fall within the flammable vapor cloud zone), including the U.S. Customs

Building on Terminal Way, the supports for the Vincent Thomas Bridge, U.S. Navy Mole, and Fish Harbor canneries (high-density working population). This alternative is therefore unacceptable because of safety criteria.

3. Additional Area near Wilmington Liquid Bulk Tank Farm. No additional acreage is available in the immediate vicinity of the Wilmington Liquid Bulk Tank Farm for the development of the 5.6-million-barrel capacity tank farm because of the constraints of existing industrialized development. POLA is acquiring a number of parcels of private property in the Wilmington community immediately south of the Wilmington Liquid Bulk Tank Farm site with the intent of consolidating them for port-related uses. The target date for acquisition of individually owned properties is the year 2000. This time frame is beyond the time required to implement the project.

4. Anchorage Road Area. POLA-owned property lying north of Cerritos Channel could be utilized as the main terminal site. This property lies behind dikes and is an operating oil field. It is surrounded by nine independently operated marinas with a combined total of over 1,000 slips. Because construction of a major tank farm in this recreational area is inconsistent with the POLA's Risk Management Plan, this alternative has not been considered further.

5. Floating Terminal Facility. A floating terminal facility in the POLA outer harbor of equal capacity to the Pactex proposal would consist of four 225,000-dwt interconnected tankers moored to fixed pile dolphins in the approximate location of the proposed 70-acre terminal. The 75-ft-deep channel and berthing area would be in the same location as the Pactex proposal. The ships' berths and metering/service area would be pile-supported and constructed in the same location as the Pactex proposal. Fully loaded, the floating tankers would require a bottom depth of -80 ft MLLW. This would require approximately 1.2 million yd^3 additional dredging for a total of 16.2 million yd^3 to be disposed of at the EPA-approved ocean disposal site (latitude 33°37'06"N, longitude 118°17'24"W) or in another approved landfill site in San Pedro Bay. The permanent mooring of four large tankers in the POLA's outer harbor would:

(1) Reduce the potential area for development of future outer harbor landfill projects (Table 2.6-1, subsection 4.6)

(2) Present a substantially greater oil spill risk than an island terminal

(3) Have substantially greater maintenance requirements, including periodic downtime for docking

(4) Require extensive corrosion protection.

These comparative disadvantages, coupled with the additional dredging required and potentially greater disposal impacts, offset any potential benefits of this alternative. As such, this alternative was eliminated.

B. Alternative Berthing Locations in San Pedro Bay

1. The Port of Long Beach. Three locations in the Port of Long Beach were examined as alternative sites for the berthing facility. The sites reviewed were Pier J, the Navy Mole, and Anchorage C-5.

a. Pier J. The outer harbor area between Pier J and the Long Beach Channel and the area on or near the southeast corner of Pier J (4 acres) was the site selected for the previously proposed SOHIO project, as well as by Pactex, in its initial application to the Port of Long Beach. Tankers would offload crude oil for movement to terminal facilities located in the vicinity of, but outside of, the boundaries of the Port of Long Beach. [A detailed analysis of this alternative is available in the various documents prepared for the SOHIO project (BLM, 1976).]

Dredging the outer harbor basin area south of Pier J would be required to provide access and operating space for the tanker berths. Dredging to a depth of approximately 75 ft would be required in the berthing and channel access area. A breakwater would have to be created on the southern and eastern perimeters of the berth basin. The berths would be located south of Pier J in a harbor district designated for crude oil handling.

In 1976, SOHIO proposed use of Pier J for its terminal; at that time, land was available for a marine terminal. As a result of further study and analysis by the Port of Long Beach, the Pier J area has been entirely committed to container operations and no additional land would be available. Therefore, this alternative was eliminated.

b. Navy Mole Area. A two-berth alternative in the outer Long Beach Harbor in the southwestern corner, adjacent to the Navy Mole, was studied and evaluated for the berthing location. Dredging the outer harbor basin area adjacent to the Navy Mole would be necessary to provide access and operating space for two tanker berths capable of accommodating initial tankers up to 165,000 dwt. Dredging to a depth of approximately 75 ft would be required in the berthing and channel access area. It would be necessary to build a rock dike retaining structure adjacent to the Mole in order to square the end of the Navy Mole and to make use of the almost 60-acre enclosed area to dispose of nearly 5 million yd^3 of dredged material. Ten of the 60 acres of landfill would have been required for project use for the metering facility. In addition, a breakwater of approximately 4,000 ft would have to be constructed seaward of the berthing channel with the remaining dredge material being beached seaward from this breakwater.

There is still an uncertainty whether the Port of Long Beach would locate a channel adjacent to the Navy Mole or would construct a landmass there and have the channel in the center of the proposed landfill area. An analysis is presently under way to allow the Port of Long Beach to make this ultimate decision. Because timing is a critical factor in this project, this alternative was determined not to be viable.

The location of storage at the Navy Mole is not possible. The use of the Navy Mole location requires a large terminal area inland (see later discussion). In addition, more shallow water habitat would be impacted by this option.

c. Vicinity of Anchorage C-5 (Long Beach outer harbor). Minimum channel dredging would be required to locate a berthing area in the vicinity of Anchorage C-5 in the Long Beach outer harbor. The berthing facility would be located on piles and platforms, leaving no room in the deep area for the terminal facility. To construct an island of sufficient size to accommodate the terminal facility would require dredging of a borrow area in the vicinity of Anchorage C-5. The impact of creating another deep borrow area would offset the benefit of using this area.

2. POLA 190-Acre Landfill Area. The newly created 190-acre landfill on Terminal Island was considered as an alternative site because the land area was already in existence. The major factor for the immediate elimination of this location was the volume of bottom material that would need to be dredged to achieve a depth of 75 ft, as well as the time constraint to move this volume of material.

C. Minimum Facilities Alternatives

1. Minimum Project. Many variations of smaller sized projects could be explored as alternatives to the proposed project; however, the controlling variable for sizing a project is throughput. As proposed, the project was sized to support the anticipated excess crude oil volumes in PADD V (see subsection 1.5.1). An example of a minimum project would be one berth in the San Pedro Bay area, a maximum storage of 2.5 million barrels, and a reduced 30-in. pipeline with a system capacity of approximately 400,000 bpd. The impacts on the environment resulting from this minimum alternative, as compared to the Pactex proposal, are not reduced in direct proportion to the reduced throughput capacity. In fact, the dredging of the harbor and construction of the berth would have slightly less impact, while a 30-in. pipeline is proportionally more costly to install than a 42-in. pipeline with basically the same environmental impacts. In addition, the energy uses per barrel transported will be greater. The applicant has determined that a minimum, such as the one indentified above, would be uneconomical to construct and operate. Therefore, minimum project alternatives were eliminated.

2. Minimum Landfill for Terminal in Los Angeles Harbor. This alternative would require the construction of a fully contained, approximately 50-acre island in the same location as the terminal in the proposed project. The ships' berths and metering/service area would be pile-supported and constructed in the same location as the Pactex proposal, 1,000 ft south of the reduced landfill. The excess dredged material from the 75-ft-deep channel, basin, and berth would be disposed of at sea at the EPA-approved ocean disposal site (latitude 33°37'06"N, longitude 118°17'24"W) 5 nautical miles south of Point Fermin. This alternative would result in the loss of a valuable resource (fill material) to POLA. As such, this alternative has been eliminated from further study. The excess material could be transported hydraulically to another approved landfill site within San Pedro Bay, provided such site has an identified need, environmental documentation completed, and permits obtained. Determination of such requirements are beyond the scope of the Pactex project.

3. Landfill/Terminal Area Outside Breakwater. Two berthing facilities would be constructed inside and immediately north of the middle breakwater, and a 75-ft-deep channel and turning basin would be constructed to these berths inside the breakwater. A fully contained 70-acre landfill would be constructed outside and contiguous to the breakwater upon which would be constructed the metering station, air equipment, and 70-acre terminal facility. Although the total dredging would be reduced from the Pactex proposal by approximately 25%, the containment dike would be about 1,000 ft longer. Because this new offshore dike would effectively have to serve as a portion of the breakwater, its structural section would be substantially heavier than the project's proposed containment dikes inside the harbor. The hydraulic fill required to construct the terminal's landfill in 50 ft of water would be approximately 8 million yd^3 resulting in excess material disposal as discussed above (subsections 2.4.2.A.5 and 2.4.2.C.2). Construction of the berthing facilities adjacent to the breakwater structure would be more difficult than the Pactex proposal because they could not be designed as an integral part of the containment dike. Although the terminal facility would be further from populated areas, it would be even closer to the berthing area than for Alternative 1 (-70-ft channel, 96-acre landfill), thereby increasing the risk. The terminal would also be less efficient because of a mile longer pumping distance from the surge tanks to the primary pump station. The advantage of less dredging and fill is more than offset by the comparative disadvantages summarized above and, in light of the uneconomical commitment of resources required to construct a new breakwater section and dispose of excess fill, this alternative was eliminated.

4. Single-Point Mooring. The USCG was interviewed about the possibility of constructing and operating a safe monobuoy crude oil offloading system inside and/or outside of the POLA harbor area. Monobuoys located inside the harbor area would still require that the harbor and access be dredged to 75-ft depths for the tankers. This material would have to be used for the proposed landfill island or otherwise disposed of.

The USCG stated that monobuoys could be constructed safely outside of the harbor area (Onstadt, 1985); however, the USCG would oppose construction of monobuoys in the precautionary area in the approach to the harbor (47 FR 27430). The USCG further stated (Onstadt, 1985) that there is suitable water beyond the precautionary area for monobuoys.

As an alternative to dredging a 75-ft-deep channel to a berthing area inside the breakwater, offloading the crude oil could be accomplished by single-point mooring systems or monobuoys located in existing water, which is 75 ft deep, lying approximately 1 mile south of the port area. Two 48-in. pipelines would be laid from the monobuoy-offloading facility on or below the ocean floor, under or through one of the breakwaters to a surge tank farm on existing land within the pumping range of ships. Although such a system is technologically feasible (in fact, many are in operation throughout the world), this alternative has been eliminated from further study for a number of reasons, including:

(1) It would lie in the precautionary area that links the coastal shipping lanes to the harbor entrances; as such, it would not be allowed by the USCG because of navigational safety concerns.

(2) To locate at a single-point mooring outside the precautionary area (shown on NOAA map No. 18746), ships would have to pump the crude oil at least 9 miles to an adequately sized onshore tank farm, which is beyond the maximum pumping range of 5 to 6 miles.

(3) The use of monobuoys would preclude the use of the innovative air pollution control system for the tanker stack emissions. The SCAQMD has stated that it would probably not be feasible to get air permits for this project on a timely basis without the use of the innovative control system. To implement the proposed technology, a fixed platform would have to be used because the system proposed herein must be able to adjust to a wide range of vessel sizes (as shown in Table 2.2.1-1) and cannot be accommodated on a monobuoy system.

(4) No suitable tank farm site of project design capacity would be available. Locating the monobuoys north or south of the precautionary area would require the pipelines and/or terminal areas to be located through heavily developed residential areas or areas such as Palos Verdes shoreline or undeveloped Orange County coastline, rather than the industrialized POLA area. Placement of a monobuoy in these locations would be inconsistent with the mandate of the coastal plan.

(5) If single-point moorings were inside the harbor, dredging of the 75-ft-deep channel and turning basin would still be required.

(6) Oil spills would be more containable at a berthing facility inside the breakwater.

(7) Downtime caused by weather conditions would be greater (relative to island alternatives).

D. Pipeline Component Alternatives

1. Celeron/All-American Pipeline Project. Celeron/All-American Pipeline Project proposes to transport up to 300,000 bpd of heavy, high-sulfur OCS crude oil through a heated pipeline from Santa Barbara County to McCamey, Texas (BLM, 1984a). The proposed Pactex pipeline project would transport up to 900,000 bpd of crude oil from Alaska, Pacific rim, and OCS supplies from POLA to Midland, Texas, through a 42-in.-diameter line that is neither heated nor insulated. The Celeron/All-American pipeline will utilize a ROW that parallels the proposed Pactex ROW for a distance of 650 miles along the route from Blythe, California, to Texas. Some segments of the two pipeline ROWs will differ.

The OCS crude oil requires heated pipelines because of its high viscosity. The energy required for heating fuel was estimated to be 57,300 Btu/barrel or $0.28/barrel (BLM, 1984a, p. 2-62). If the crude oil proposed to be shipped by Pactex were to be shipped in the Celeron/All-American pipeline, tariffs would increase by $0.28/barrel. Hence, this alternative is not believed viable to satisfy the requirements because:

(1) Capacity planned for in the proposed All-American pipeline system would not be adequate to meet Pactex's objective.

(2) Pactex-transported crude oil does not require heating. Thus, transport through the heated All-American system would result in nonessential increased energy consumption and tariffs.

(3) The proposed All-American pipeline system does not include facilities to offload marine tankers.

(4) The two projects, although partially overlapping in their ability to carry the same crude oil, were conceived and designed for different purposes.

2. Arco Four Corners Pipeline. The Arco Four Corners Pipeline is an existing 16-in. system running from Long Beach, California, to Texas. It is an unheated pipeline with a maximum capacity of 65,000 to 70,000 bpd. As a small-capacity, common carrier system, this alternative could not meet the project objectives. This pipeline could be expanded to a capacity of just over 100,000 bpd, but it would still not meet project objectives without significant new construction.

E. Other Alternatives

All tankers are built with their own pumps for offloading crude oil. Requiring the use of electric pumps in lieu of the ships' pumps would necessitate retrofitting existing tankers not under Pactex control. In addition, such systems are not currently used; therefore, the alternative is not considered viable at this time from a safety or engineering viewpoint.

2.5 COMPARISONS OF IMPACTS OF ALTERNATIVES

This subsection presents a brief comparison of how the alternatives to the proposed Pactex project would meet project objectives and gives a summary comparison of the impacts or effects on the environment. The project alternative that would have the least environmental consequences is no project; however, that alternative would not meet the objectives of the proposed project. The landfill alternative that reduces the marine environmental impact is the 96-acre, 70-ft dredge depth. However, this alternative does not fully meet project objectives and offers a lesser margin of safety. The Coachella Valley pipeline route alternative reduces the impact to the critical habitat of the fringe-toed lizard and achieves the project objectives at a comparable cost.

2.5.1 GENERAL PROJECT ALTERNATIVES

The comparative impacts of the proposed project and the no-project alternatives are summarized in Table 2.5-1 and are described briefly in the following discussion.

Table 2.5-1 - Comparative Analysis of the No-Project Alternative

Area of Comparison	Pactex Proposal	No Project
Objectives		
Operation (objectives met)	Yes	No
Environmental Impacts		
Marine Habitat Loss	Yes	No
Marine Resource Impacts	Yes	No
Air Quality		
Temporary air quality impacts	Yes	No
Increased levels of emissions from tanker offloading operations for which offsets do not apply[a]	Yes	No
Maintenance of ambient levels through offsets or no action (tank farms)	Yes	Yes
Geology and Seismic Hazards		
Landfill liquefaction potential	Yes	No
Potentially active faults crossed	Yes	No
Groundwater		
Groundwater basins crossed	Yes	No
Soils		
Erosion and landslide potential; crossing agricultural areas	Yes	No
Freshwater Biology		
Number of perennial streams crossed with important species	6	0
Terrestrial Biology		
Desert tortoise habitat crossed	Yes	No
Desert bighorn habitat crossed	Yes	No
Coachella Valley fringe-toed lizard habitat crossed	Yes	No
Federally protected species affected (No.)	6	0
Oil Spill Potential and ROW Sensitivity	Yes	No

Table 2.5-1 (Contd)

Area of Comparison	Pactex Proposal	No Project
Environmental Impacts (Contd)		
Paleontology/Cultural Resources	Yes	No
Noise (temporary increase)	Yes	No
Socioeconomics		
Transportation costs	Reduced	Same as present
Delivery time	Decreased	Same as present
Enhanced national security	Yes	No
Employment generation	Yes	No
Increased capital investment	Yes	No
Increased vessel activity	Yes	No
Energy Consumption		
Net conservation of oil (reduction of consumption with pipeline versus tanker transport)	Yes	No
Land Use		
Land removed for pump stations and storage facilities (acre)	276	0
Visual Resources		
Pump stations requiring visual classification changes (No.)	3	0
Cost	$1.6 billion	0

[a]Excludes ROG for which offsets are required.
Source: ES, 1985.

A. No-Project (No-Action) Alternative

The no-project alternative would have none of the project-specific impacts of the proposed alternative. The following benefits probably would be lost if the project were not approved:

(1) Reduced crude oil market delivery time.

(2) Direct economic benefit of up to 3,000 jobs during construction and up to 200 permanent jobs.

(3) Major domestic purchase of materials, which would have a positive impact on the nation's economy.

2.5.2 LANDFILL CONFIGURATION ALTERNATIVES

A comparison of the landfill configuration alternatives is shown in Table 2.5-2 and summarized in the following subsections.

A. Alternative 1: -70-ft Dredged Depth and 96-Acre Landfill Island

This landfill alternative would be 17% smaller and would affect 183 acres of soft bottom habitat or 25 acres less than the proposed landfill island. The oceanographic and marine biologic impacts would be comparable but slightly reduced with this alternative. There would be slightly different but insignificant effects on the environment. The substantital differences relate to:

(1) Reduced cost of $14 million.

(2) Failure of this alternative to meet all objectives of cargo handling because of the necessity of using smaller draft ships with the 70-ft dredge depth.

(3) A smaller margin of safety caused by placement of the tank farm 400 ft closer to the berthing area.

B. Alternative 2: Fully Diked Landfill Island

This landfill alternative would have marine biological and oceanographic impacts that would persist 12 months longer than the proposed project for diking activities on the north and west sides. All other effects on the environment are identical to the proposed project.

The alternative would meet the project objectives but at an additional cost of $30 million.

2.5.3 PIPELINE ROUTING ALTERNATIVES

A comparison of the Coachella Valley alternative to the proposed route is shown in Table 2.5-3. The alternative would avoid crossing the critical habitat of the Coachella Valley fringe-toad lizard although known habitat would still be crossed. All other effects on the environment are identical.

The alternative would achieve the project objectives at approximately the same cost.

Table 2.5-2 - Summary of Comparative Analysis of Landfill Configuration Alternatives

Area of Comparison	Components: Proposed Landfill Island	Components: Alternative 1 (96 acres, 70-ft dredge)	Components: Alternative 2 (170 acres, full dike)
Objectives			
Operation (objectives met)	Yes	No	Yes
Environmental Impacts			
Marine Biology and Oceanography			
Loss of benthic habitat by fill (acre)	208	183	208
Temporary loss of benthic habitat by dredge (acre)	300	300	300
Gain of rocky habitat under dike (acre)	19	18	31
Gain of piling habitat	3	3	3
Duration of increased turbidity and impacts from dredge and fill activities (month)	12-15	12-15	24-27
Air Quality			
Combustion emissions from construction equipment	Yes	Less	More
Fugitive dust during construction	Yes	Less	Same as proposed
Operational emissions	Yes	Same as proposed	Same as proposed
Geologic and Seismic Setting			
Seismic hazard and liquefaction potential	Yes	Same as proposed	Reduced liquefaction potential
Oil Spill Risk and Effects	Yes	Same as proposed	Same as proposed
Cultural Resources			
Number of known sites potentially affected			
Fill	0	0	1
Dredge	3	3	3
Paleontology			
Number of known localities lost	0	0	0
Amount of exposure of potentially moderate importance lost (acre)			
Fill	208	183	208
Dredge	300	300	300
Noise			
Construction (duration)	Yes	Same	Longer
Operation	Same	Same	Same
Socioeconomics			
Employment (No. of persons)			
Construction	3,000	2,900	3,100
Operation	162	162	162
Peak construction housing accommodations	1,100	1,100	1,200
Transportation			
Vessel trips to meet objectives	294 to 408	More	Same
Vessel and barge traffic for construction	Yes	Less	More
Energy			
Consumption during construction (MWh)	31.7	Less	More
Visual Resources			
Landfill	Same	Slightly smaller	Same
Terminals	Same	Same	Same
Island components	Same	Same	Same
Safety			
Setback of tanks from berth area (ft)	1,000	400	1,000
Costs	Base case	$14 million less	$30 million more

Source: ES, 1985.

Table 2.5-3 - Summary of Comparative Analysis of Pipeline Route Alternatives

Area of Comparison	Proposed Route	Coachella Valley
Objectives		
Operation (objectives met)	Yes	Yes
Environmental Impacts		
Oceanography and Marine Biology	None	None
Air Quality	Same	Same
Geologic and Seismic Setting	Same	Same
Soils	Same	Same
Surface Water	Same	Same
Groundwater		
Miles of sensitive[a] groundwater basins crossed	556	558
Freshwater Biology	Same	Same
Terrestrial Biology		
Miles (acres) of habitat disturbed	819 (9,927)	821 (9,952)
Miles (acres) Coachella Valley fringe-toed lizard present occupiable habitat crossed[b]	0.4 (5)	0.6 (8)
All other impacts	Same	Same
Oil Spill Potential and Sensitivity Along ROW	Same	Same
Number of Cultural Resources known sites	6	0[c]
Paleontology		
Number of known localities impacted	5	0
Miles of highly important exposure crossed	3	0
Noise	Same	Same
Socioeconomics	Same	Same
Land Use and Recreation	Same	Same
Visual Resources	Same	Same
Costs	Base case	Slightly higher

[a]Near surface, heavily used water resources.
[b]As assessed during field examination, May 1985.
[c]Unknown potential; because of disturbance and lack of favorable conditions, fewer resources are expected.
Source: ES, 1985.

2.6 INTERRELATIONSHIP WITH OTHER PLANNED OR PROPOSED PROJECTS

Projects potentially interrelated with the Pactex project were evaluated to determine if their impacts would interact in a cumulative manner. The projects considered are those that are currently proposed, those that have a reasonable likelihood of occurring, and those that would use or compete for the same resources. The four projects that would interrelate with the Pactex pipeline are presented in Table 2.6-1.

2.7 SUMMARY OF ENVIRONMENTAL IMPACTS: COMPARISON OF THE PACTEX PIPELINE PROJECT AND THE PROPOSED ALTERNATIVES

A summary of the environmental impacts resulting from the Pactex proposal, the three project component alternatives and the no-project alternative is presented in the following tables. Table 2.7-1 summarizes the impacts for the complete Pactex project and the one pipeline component routing alternative through the Coachella Valley in California. The entire lengths of the two routes are compared, not just the alternative section of the Coachella Valley route. For the disciplines of transportation/energy/utilities/public services, oceanography and marine biology, and system safety and reliability, no major impacts were identified; therefore, these disciplines are not included in Table 2.7-1.

In Table 2.7-2, a comparison is made between the Pactex proposal, the two project component landfill alternatives, and the no-project alternative in POLA. For Table 2.7-2, Alternative 1 corresponds to the proposed 96-acre landfill island; Alternative 2 refers to the fully contained 170-acre landfill terminal. Details of design specifications for these alternatives are found in subsection 2.3.2. Soils, surface water, groundwater, freshwater and terrestrial biology, transportation/energy/utilities/public services, noise, and system safety and reliability are excluded from analysis in Table 2.7-2 because no major impacts would occur to these environmental areas from implementation of any alternative.

Additional details on impacts for specific disciplines mentioned in Tables 2.7-1 and 2.7-2 are found in the Summary and in Section 4. A comparison of the Pactex proposal and the no-project alternative is presented in Table 2.5-1.

Table 2.6-1 - Projects Potentially Interrelated to the Pactex Pipeline Project

Project	Description/Location	Interrelationship
Celeron/All-American Pipeline Project	A common carrier pipeline to transport up to 300,000 bpd of heated crude oil produced from the Santa Barbara and Santa Maria Basins. The line would be 1,291 miles long, extending from western Santa Barbara County to McCamey, Texas.	Potential competitor for transportation of low viscosity crude oil. Potential interrelationship in areas of employment and housing during construction, and tax benefits to government.
Getty (Texaco) Pipeline Project	A pipeline to transport 250,000-400,000 bpd of heated crude oil produced from the Santa Barbara and Santa Maria Basins. The 112-mile line would extend from the Gaviota Marine Terminal to Texaco's San Joaquin transportation refinery network at Emidio, California, and serve as west leg of southern California pipeline system.	Potential supplier for some of the crude oil.
Southern California Pipeline System (east leg)	A 150-mile crude oil pipeline from Kern County to Los Angeles refineries to transport 200,000 bpd of Santa Barbara offshore production and 130,000 bpd from the San Joaquin Valley. The participants are Arco, Texaco U.S.A, Chevron, and Shell Oil Company.	Potential supplier for transportation of low viscosity San Joaquin Valley and California OCS crude oil.
Palo Verde-Devers Transmission Line System	Second stage of development would consist of another 500-kV line from the Devers subsection located south of Desert Hot Springs, California, to the Palo Verde Nuclear Power Plant the line would parallel I-10 in California. No application for construction of the second stage has yet been submitted.	Potential interrelationship in areas of employment and housing.
Future Planned San Pedro Bay Outer Harbor Development	Los Angeles and Long Beach Harbor Departments in conjunction with the COE have developed a master plan of channels and landfills to meet the cargo-handling demands to the year 2020. When complete, this plan would create 2,600 acres of new land. The next anticipated development in POLA outer harbor would be the proposed south landfill project, a 340-acre landfill contiguous to the Pactex proposal.	Potential interrelationship in areas of marine transportation and land use, as well as cumulative environmental impacts.

Table 2.7-1 - Impact Summary: Comparison of Pactex Proposal, Coachella Valley Alternative, and No-Project Alternative

Impact	Pactex	Coachella Valley Alternative	No-Project Alternative
Air Quality			
Combustion emissions from construction equipment	Yes	Yes	No
Fugitive dust emissions from construction-disturbed areas	Yes	Yes	No
Operational emissions	Yes	Yes	No
Geologic and Seismic Setting			
Quaternary fault zones crossed (No.)	6	6	0
Unstable slopes crossed (No.)	5	5	0
Areas subject to subsidence (No.)	4	4	0
Soils[a]			
Sensitive areas (agricultural land) (No.)	5	5	0
Approximate miles (acre) of sensitive soils	91 (1,103)	91 (1,103)	0
Surface Water			
Perennial streams crossed (No.)	11	11	0
Streams with potential for streambed erosion/ pipeline damage during peak runoff events (No.)	6	6	0
Streams with municipal supplies (No.)	4	4	0
Groundwater			
Approximate miles of sensitive groundwater basins crossed[b]	556	558	0
Freshwater Biology			
Perennial or large intermittent streams crossed with important fish species (No.)	6	6	0
Terrestrial Biology			
Miles (acre) of habitat disturbed	819 (9,927)	821 (9,952)	0
Coachella Valley fringe-toed lizard critical habitat crossed	Yes	No[c]	No
Federal- and state-protected species affected	Yes	Yes	No
Desert tortoise habitat crossed	Yes	Yes	No
Desert bighorn habitat crossed	Yes	Yes	No
Stream crossings with riparian vegetation potentially disturbed (No.)	10	10	0

Table 2.7-1 (Contd)

Impact	Pactex	Coachella Valley Alternative	No-Project Alternative
Socioeconomics			
Employment (No. of persons)			
Construction	3,000	3,000	0
Operation	162	162	0
Peak construction housing requirements (No. of rental units/motel/hotel)	1,106	1,106	0
Land Use and Recreation			
Land used as terminal storage sites (acre)	215	215	0
Land used for pumping stations (acre)	61	61	0
Cultural Resources			
Known sites (No.)	6	0[e]	0
Paleontology			
No. of known localities impacted	5	0	0
Miles of highly important exposure crossed	3	0	0
Visual Resources			
Pump stations causing reduction of scenic quality (No. of locations)	3	3	0
Noise			
Construction noise would exceed ambient levels at residences, schools, and parks along the pipeline ROW	Yes	Yes	No
Oil Spill Potential and Effects			
Probability of spill greater than 9.5 barrels for new pipeline (spill/year for overall length)	0.72	0.72	0
Probability of spill greater than 9.5 barrels for 30-year old pipeline (spill/year for overall length)	1.85	1.85	0
ROW crosses areas sensitive[d] to an oil spill	Yes	Yes	0

[a]Acres of sensitive (agricultural) soils calculated for a 100-ft ROW.
[b]Assumes a worst-case analysis for the number of miles of sensitive groundwater basins crossed because detailed information for each basin was not available (Tables 3.2.5-1 and 3.2.5-2.
[c]Occupied habitat affected.
[d]Sensitive areas = groundwater basins, agricultural land, and streams.
[e]Due to disturbance and lack of favorable conditions, fewer resources are expected.
Source: ES, 1985.

Table 2.7-2 - Impact Summary: Comparison of Pactex Proposal, Landfill Alternative 1 (96-acre landfill), Landfill Alternative 2 (170-acre landfill), and No-Project Alternative

Impact	Pactex	Landfill Alternative 1	Landfill Alternative 2	No-Project Alternative
Air Quality				
Combustion emissions from construction equipment	Yes	Yes	Increase in combustion emissions	No
Fugitive dust emissions from construction-disturbed area	Yes	Slightly less than Pactex proposal	More than Pactex proposal	No
Operational emissions	Yes	Yes	Identical	No
Geologic and Seismic Setting				
Presence of seismic hazard with potential for damage to island facilities	Yes	About the same as the Pactex proposal	Reduced potential for liquefaction-induced ground failure due to completely diked construction	No
Socioeconomics				
Employment (No. of persons)				
Construction	3,000	2,900	3,100	0
Operation	162	162	162	0
Peak construction housing requirements (No. of rental units/motel/hotel)	1,106	1,066	1,144	0
Land Use and Recreation				
Land utilized as terminal storage sites (acre)	215	196	270	0
Land for pump stations (acre)	61	61	61	0
Cultural Resources				
Number of known sites	3	3	4	0
Paleontology				
No. of known localities impacted	0	0	0	0
Amount of exposure of potentially moderate importance lost (acre)				
Fill	208	183	208	0
Dredge	300	300	300	0
Visual Resources				
Reduction of scenic quality from pump station (No. of locations)	3	3	3	0

Table 2.7-2 (Contd)

Impact	Pactex	Landfill Alternative 1	Landfill Alternative 2	No-Project Alternative
Oceanography and Marine Biology				
Total dredge footprint (loss of deep soft bottom habitat, acre)	300	300	300	0
Total island footprint (loss of deep soft bottom habitat, acre)	208	183	208	0
Gain of new deep benthic sideslope habitat from dredging:				
North of breakwater (acre)	1.4	1.2	1.5	0
South of breakwater (acre)	1.1	0.9	1.1	0
Gain of new rocky habitat from diking (acre)	19	18	31	0
Gain of new piling habitat (acre)	3	3	3	0
Probable minimum time for recolonization in dredge areas (year)	2	2	2	0
Potential for temporary decrease in local availability of northern anchovy for sport and bait fisheries in the harbor	Yes	Yes	Yes	No
Benthic area affected by pipeline construction (acre)	5.5	5.5	5.5	No
Potential for temporary decrease in utility of feeding habitat and effects on breeding success of California least tern if pipeline construction through the shallow water habitat adjacent to the 190-acre landfill takes place during the April-to- September breeding season	Yes	Yes	Yes	No
Potential for long-term impacts on the harbor marine environment in the event of a Scenario I or a Scenario II oil spill (subsection 4.2.15.F)	Yes	Yes	Yes	No
Estimated downtime when critical wave conditions occur (days)				
Berth A	75	75	75	0
Berth B	5	5	5	0

Table 2.7-2 (Contd)

Impact	Pactex	Landfill Alternative 1	Landfill Alternative 2	No-Project Alternative
Oceanography and Marine Biology (Contd)				
Reduction of flow volume through Angel's Gate (%)	3	<3	3	0
Reduction of flow volume through Angel's Gate	Yes	Yes	Yes	No
Temperature increase of water surrounding scrubber outfall (°F)	3.3	3.3	3.3	0
Estimated displacement of tidal prism for a 7-ft spring tide (million ft^3)	35.0	30.7	40.6	0
Chronic deposition and erosion of sediment from the north and west landfill island perimeters	Yes	Yes	No	No
Duration of turbidity generation and water quality impacts from dredge and fill activities (month):				
Proposed landfill island	12-15	12-15	24-27	0
Proposed pipeline in POLA	6-8	6-8	6-8	0
Oil Spill Potential and Effects				
Probability of spill greater than 50 gallons in POLA from all vessels, including Pactex tankers, in a 20-year period	1.0	1.0	1.0	0

Source: ES, 1985.

SECTION 3
AFFECTED ENVIRONMENT

SECTION 3
AFFECTED ENVIRONMENT

SECTION 3

AFFECTED ENVIRONMENT

3.1 INTRODUCTION

The Pactex EIR/EIS analyzes the environment that would be affected by the proposed Pactex berthing/terminal in POLA and the pipeline system to Midland, Texas. The study area varies with different resources. For some land-based resources, the affected area is confined to the immediate area of disturbance. For other resources such as air quality and socioeconomics, a regional study area was used.

In addition to the Pactex proposal, two POLA landfill alternatives and a routing alternative through the Coachella Valley have also been identified.

The four segments, which in total constitute the affected environment, are identified as:

(1) POLA

(2) POLA to Blythe, California

(3) Blythe, California, to Pine Springs, Texas

(4) Pine Springs, Texas, to Midland, Texas

The Blythe, California, to Pine Springs, Texas, segment is parallel and adjacent to the route of the All-American pipeline, and an analysis of that segment is incorporated from the All-American EIR/EIS by reference and summarized, herein, as appropriate.

Resources that would not be significantly affected by implementation of the Pactex proposal or the alternatives, issues that were not raised in the public scoping process or in the responses to the Notice of Preparation, are not discussed in detail in this section. The criteria for determining the significance of impacts and the assumptions for the analyses for each resource are described in Section 4.

3.2 PACTEX PROPOSAL

The affected environment of each resource area for the Pactex proposal is reviewed and analyzed in this subsection.

3.2.1 AIR QUALITY

This subsection provides information on applicable air quality regulations that would affect the construction and operation of the Pactex pipeline. In addition, information regarding climatology, meteorology, and existing air quality along the pipeline route is presented.

A. Applicable Regulations

Construction and operation of the Pactex pipeline would result in emissions of various air contaminants at the terminals and along the entire pipeline length. Regulations concerning emission rates and ambient air impacts have been promulgated on the local, state, and Federal levels, which regulate the effect that a proposed source would have on local and regional air quality. The following brief synopsis is given of the applicable air quality regulations.

1. New Source Review (NSR) Rule as Established by the South Coast Air Quality Management District (SCAQMD). The SCAQMD has local jurisdiction over air pollution sources in Los Angeles, Orange, and the nondesert portions of Riverside and San Bernardino Counties. This area has been termed the South Coast Air Basin. The SCAQMD has adopted an NSR regulation that sets forth preconstruction review requirements for new or modified stationary sources to ensure that the operation of the stationary sources does not interfere with progress in attaining the National Ambient Air Quality Standards (NAAQS), without unnecessarily restricting future economic growth within the district. This rule applies to sources whose emissions exceed the following thresholds:

Emission	Net Cumulative Emission kg/day	Net Cumulative Emission lb/day
Carbon monoxide	249	550
Sulfur dioxide	68	150
Nitrogen oxides	45	100
Particulate matter	68	150
Reactive organic gases (ROG)	34	75
Lead compounds	1.4	3

Any source that exceeds the above thresholds is subject to the following conditions:

(1) All stationary sources emitting 25 tons per year (tpy) or more of any air contaminant and owned or operated by the applicant in the state of California must be in compliance with all applicable emission limitations and standards that are part of the State Implementation Plan (SIP).

(2) The new source or modification must be constructed using best available control technology (BACT) for each affected air contaminant.

(3) The total accumulated increase in emissions at the subject source, for each air contaminant, must be offset.

(4) Modeling (or other approved analyses) has substantiated that the new source or modification would not cause a violation or make measurably worse an existing violation of any NAAQS at any receptor location in the district. Modeling is not required for ROG if all offset sources are within a distance of 5 miles from the affected permit units.

(5) The new source or modification must not result in emissions that interfere with the schedule of reasonable further progress set forth in the SIP for the SCAQMD.

Exemptions from sections of NSR regulations can be granted to a source that uses innovative technology to reduce emissions. "Innovative technology" as defined by the SCAQMD includes innovative equipment or a process that:

(1) The applicant demonstrates would likely result in a significantly lower emission rate from the affected source than would have occurred with the use of previously recognized BACT.

(2) Can be expected to serve as a model for emission-reduction technology.

2. Prevention of Significant Deterioration (PSD). The basic goal of the Environmental Protection Agency (EPA) PSD regulations is to ensure that air quality in clean air areas does not significantly deteriorate, while maintaining a margin for future industrial growth. The PSD regulations focus on those industrial plants, both new and modified, that create large increases in the emissions of certain air pollutants.

PSD review requirements apply only in certain geographic areas of the United States; specifically, PSD applies to construction in those areas designated as "attainment or unclassifiable" under Section 107 of the Clean Air Act for any criteria pollutant (carbon monoxide, nitrogen oxides, sulfur dioxide, particulate matter, ozone, and lead). Construction involving only pollutants for which an area is designated as "nonattainment" does not require a PSD permit. Any part of the country with an attainment or unclassifiable designation for at least one criteria pollutant is known as a PSD area. Proposed new sources and modifications in these areas are potentially subject to PSD review. Currently, the South Coast Air Basin is designated as attainment for sulfur dioxide and, therefore, is a PSD area. The types of construction subject to PSD review are new major sources and major modifications. A source is considered major if:

(1) It is one of the 28 named source categories and emits or has the potential to emit 100 tpy or more of any pollutant regulated by the Clean Air Act.

(2) It is an unlisted stationary source that emits or has the potential to emit 250 tpy or more of any pollutant regulated by the Clean Air Act.

If a source is determined to be major, then the emissions of attainment and noncriteria pollutants are compared to the following PSD significant emission rates:

Pollutant	Emissions Rate (tpy)
Carbon monoxide	100
Nitrogen oxides	40
Sulfur dioxide	40
Particulate matter	25
Ozone [volatile organic compounds (VOC)]	40 (of VOCs)
Lead	0.6
Asbestos	0.007
Beryllium	0.0004
Mercury	0.1
Vinyl chloride	1
Fluorides	3
Sulfuric acid mist	7
Hydrogen sulfide (H_2S)	10
Total reduced sulfur (including H_2S)	10
Reduced sulfur compounds (including H_2S)	10
Any other pollutant regulated	Any emission rate
Each regulated pollutant	Emission rate that causes an air quality impact of 1 ug/m^3 or greater (24-hour basis) in any Class I area located within 6.2 miles of the source

The following analyses are performed for each pollutant emitted in significant quantities:

(1) BACT.
(2) Air quality impact analysis.
(3) Additional impacts analysis.

The applicant must demonstrate through the air quality impact analysis that neither an NAAQS nor an allowable PSD increment would be violated as a result of emissions from a source subject to the PSD requirements. The allowable increments are:

Pollutant/Averaging Time	Class II Increment (ug/m^3)
Total suspended particulate matter	
Annual	19
24 hours	37
Sulfur dioxide	
Annual	20
24 hours	91
3 hours	512

A PSD applicability determination for SO_2 would be made as part of the environmental permitting process.

3. Federal and State Ambient Air Quality Standards. Both Federal and state governments have established ambient air quality standards. The NAAQS and the California Ambient Air Quality Standards (CAAQS) are shown in Table 3.2.1-1. State ambient air quality standards in Arizona and Texas are identical to the NAAQS. The New Mexico Ambient Air Quality Standards, which differ from the NAAQS, are shown in Table 3.2.1-2.

4. Air Quality Management Plan. In response to state and Federal mandates to prepare an attainment plan for each air basin within which the applicable ambient air quality standards could be achieved by 1982, the Southern California Association of Governments (SCAG) and the SCAQMD jointly prepared the Air Quality Management Plan (AQMP) for the South Coast Air Basin, an area that includes the project site and all of the Los Angeles metropolitan area. The AQMP was certified by both the State Air Resources Board and the EPA in 1979; the attainment period was extended to 1987. The AQMP was developed around the premise that orderly growth could continue to be accommodated given the aggressive implementation of a broad-based program of pollutant emission control.

Consideration of growth was based on the SCAG-78 Growth Forecast Policy that projected population, housing, and employment growth across the region through the year 2000. This growth was then allocated throughout the region on the basis of local government forecasts, recent trends, known develoment proposals, available land, and access to employment. Although the AQMP does assume a continuation of regional growth, it must also be clear that more growth than was anticipated within any given area would make attainment that much more difficult by 1987, unless the emissions associated with that growth are offset by a reduction in growth elsewhere, by better emission control than had been expected, or both. Of importance, however, is the fact that while the allocation of growth within each area is based on a general understanding of local zoning capacity and local land-use policies, it is not based on a site-by-site assessment. Consequently, the growth potential that was implicitly assigned to each property is impossible to identify.

The emission control program promulgated by the AQMP consisted of the following general classes of mitigation measures:

Table 3.2.1-1 - National and California Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[a,b]	National Standards[c]	
			Primary[b,d]	Secondary[b,e]
Ozone (O_3)	1 hour	0.10 ppm (200 ug/m^3)	235 ug/m^3 (0.12 ppm)	Same as primary
Carbon monoxide (CO)	8 hours	9 ppm (10 mg/m^3)	10 mg/m^3 (9 ppm)	Same as primary
	1 hour	20 ppm (23 mg/m^3)	40 mg/m^3 (35 ppm)	Same as primary
Nitrogen dioxide (NO_2)	Annual	NS	100 ug/m^3 (0.05 ppm)	Same as primary
	1 hour	0.25 ppm (470 ug/m^3)	NS	NS
Sulfur dioxide (SO_2)	Annual	NS	80 ug/m^3 (0.03 ppm)	NS
	24 hours	0.05 ppm (131 ug/m^3)[f]	365 ug/m^3 (0.14 ppm)	NS
	3 hours	NS	NS	1,300 ug/m^3
	1 hour	0.5 ppm (1,310 ug/m^3)	NS	NS
Total suspended particulates (TSP)	Annual	60 ug/m^3	75 ug/m^3	60 ug/m^3
	24 hours	100 ug/m^3	260 ug/m^3	150 ug/m^3
PM_{10} (particulates less than 10 um)	Annual	50 ug/m^3	NS	NS
	24 hours	30 ug/m^3	NS	NS

Table 3.2.1-1 (Contd)

Pollutant	Averaging Time	California Standards[a,b]	National Standards[c]	
			Primary[b,d]	Secondary[b,e]
Sulfates	24 hours	25 ug/m^3	NS	NS
Lead (Pb)	30 days	1.5 ug/m^3	NS	NS
	Calendar quarterly	NS	1.5 ug/m3	NS
Hydrogen sulfide (H_2S)	1 hour	0.03 ppm (42 ug/m^3)	NS	NS
Vinyl chloride	24 hours	0.010 ppm (26 ug/m^3)	NS	NS
Visibility-reducing particles	One observ.	Sufficient amount to reduce the prevailing visibility[g] to less than 10 miles when the relative humidity is less than 70%	NS	NS

[a]California standards, other than for carbon monoxide, are values that are not to be equaled or exceeded. The carbon monoxide standards are not to be exceeded.

[b]Concentration expressed first as units in which it was promulgated. Equivalent units given in parentheses are based on a reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of Hg (1,013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

Table 3.2.1-1 (Contd)

[c]National Standards, other than for ozone and those based on annual averages or annual geometric means, are not to be exceeded more than once each year. The ozone standard is attained when the expected number of days per calendar year with a maximum hourly average concentration above the standard is equal to or less than one.

[d]National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the EPA.

[e]National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effect of a pollutant. Each state must attain the secondary standards within a reasonable time after the implementation plan is approved by the EPA.

[f]At locations where the state standards for oxidant and/or suspended particulate matter are violated. National standards apply elsewhere.

[g]Prevailing visibility is defined as the greatest visibility that is attained or surpassed around at least one-half of the horizon circle but not necessarily in continuous sectors.

NS = no standard.

Source: CARB, 1983.

Table 3.2.1-2 - New Mexico Air Quality Standards

Pollutant	New Mexico Standards	Federal Standards	
		Primary	Secondary
Total suspended particulates (TSP)			
24-hour average	150 ug/m^3	260 ug/m^3	150 ug/m^3
Annual geometric mean	60 ug/m^3	74 ug/m^3	60 ug/m^3
Sulfur dioxide (SO_2)			
24-hour average	0.10 ppm	0.14 ppm	NS
Annual arithmetic mean	0.02 ppm	0.03 ppm	NS
3-hour average	NS	NS	0.50 ppm
Carbon monoxide (CO)			
8-hour average	8.7 ppm	9 ppm	9 ppm
1-hour average	13.1 ppm	35 ppm	35 ppm
Ozone (O_3)			
1-hour average	0.06 ppm	0.12 ppm	0.12 ppm
Nitrogen dioxide (NO_2)			
24-hour average	0.10 ppm	NS	NS
Annual arithmetic mean	0.05 ppm	0.05 ppm	0.05 ppm
Lead (Pb)			
Calendar quarterly Arithmetic average	NS	1.50 ug/m^3	NS

NS = no standard.
Source: New Mexico Health and Environmental Department, 1983.

(1) Cleaner industrial processes
(2) Cleaner vehicular fuels
(3) Reduction in congestion-related emissions
(4) Incentives for reduction in traffic generation
(5) Energy conservation

B. Climatology and Meteorology Along the Proposed Pipeline Route

The following subsections provide information regarding the climatology and meteorology along the proposed pipeline route.

1. Los Angeles Harbor Area/Los Angeles Basin. The southern California coastal and offshore area has a Mediterranean climate characterized by warm, dry summers and mild winters (BLM, 1976, p. 2-8). This is a result of southern California's location on the southeastern edge of the Pacific High Pressure Area (Pacific Subtropical Anticyclone). The high-pressure cell forces most of the lows that develop to follow a course northward of the United States, bringing about a stable weather pattern that would not otherwise exist.

During the summer, the dominant climatic control is the Pacific High. This anticyclonic (high-pressure) cell strengthens and migrates northward during late spring and reaches its maximum development during the summer with its eastern edge off the coast of Oregon and California, where active subsidence occurs. This results in air heating by compression; therefore, a temperature inversion is created at about 2,000 ft or less above sea level. The relatively cold water that is flowing southward along the coast not only maintains equable summer temperatures but creates a surface inversion by chilling the overlying air. These two inversions result in an extremely stable atmospheric condition, and precipitation is generally precluded during the summer.

When summer approaches, clouds recede during the day as solar heating becomes dominant, and only night and morning coastal cloudiness remain. During summer, a thermally induced low-pressure center is created in southwestern Arizona. This, coupled with the strengthening of the Pacific High, results in a pronounced coastal sea breeze condition during the day, which is superimposed on the general northwesterly circulation. The predominant summertime wind direction is west to southwest across most of the area.

Occasional tropical cyclones develop during the summer and fall in or near the Gulf of Tehuantepec and move northwest (BLM DEIR, 1976, p. 2-10). Most of these storms dissipate long before they reach the southern California coast. However, they do cause some swell in the area at times.

As winter approaches, the Pacific Subtropical Anticyclone weakens and migrates to the south. However, the high-pressure cell continues to be the dominant controlling force for coastal southern California weather. Winter is the rainy season, with 95% of the precipitation being received between November and April. The average annual rainfall is typically between 10 in. and 15 in.; however, there are many more nonrainy days than rainy ones. The weakening and the southward migration of the Pacific Anticyclone

permit the large storms that form over the sea (Aleutian Low) to invade southern California as early as October. Usually, the storms are short in duration lasting only for 1 day or less. During winter and spring, the winds can frequently reach velocities of about 40 knots with resulting 10-ft waves. Superimposed on these winds are those associated with the passage of storms and cold fronts.

After the passage of a cold front, continental air may build up over the basin and range plateau and thus produce a cold Santa Ana condition. During these periods, extreme wind conditions may be experienced below the canyons and over the channel (gale to hurricane force winds) that can result in high seas. Despite heating by compression, temperatures remain low. The relative humidity can decrease to 5%.

2. Banning Pass to Blythe, California. This portion of the California Southeast Desert Air Basin (SEDAB) is marked by large seasonal temperature differences reflecting the absence of marine influences. Diurnal temperature ranges are also typical of an inland location. Precipitation throughout this region is normally between 4 to 5 in. per year. The climate and meteorology along this portion of the Pactex pipeline are very similar to conditions found along the route of the All-American pipeline, although the Pactex route would be located up to 50 miles farther south.

Meteorological measurements across the desert area are sparse, but the area is sufficiently homogeneous climatically to allow adequate characterization on the basis of existing data (BLM, 1984a, p.3-2). Seasonal variability in the Southeast Desert occurs mostly in terms of large temperature differences and not by precipitation levels, which are uniformly low. During winter, the area is covered by moderately intense anticyclonic circulation, except during occasional periods of frontal activity (20 to 30 on average from October through March in the northern part of the basin). Such frontal systems are relatively weak by the time they reach the basin and become more diffuse as they move southward. However, most of the precipitation received in the area is associated with frontal activity with local amounts strongly influenced by topographic features.

During the summer, the Pacific high is well developed to the west of California, and a thermal trough of low pressure covers the basin with the intensity and orientation of this low varying from day to day. Air exchange with coastal areas and the Central Valley occurs primarily through the mountain passes. Relative humidity is very low, averaging 30% to 50% in the early morning and 10% to 20% during the late afternoon. During winter, intense heating during the day and marked cooling at night are normal. The intensity of the solar radiation is conducive to photochemical smog formation.

In summer, the desert region is generally windy, with a strong convective exchange between the upper and lower atmospheric levels. During the winter, rapid nocturnal cooling at the surface retards such exchange, and calm conditions are recorded frequently. During all seasons, the predominant winds are from the south and west.

Temperature inversion conditions in the SEDAB are different from those in the coastal regions to the west. Subsidence inversions are typically 6,000 ft to 8,000 ft above the desert surface. Radiation inversions are prevalent at night throughout the year. In summer, these tend to be dissipated early in the day, but they persist through much of the day during the calmer winter months. These wintertime inversions can develop to heights of 200 ft to 2,000 ft.

The extremely high summertime temperatures can interfere with human activities making many types of pursuits hard to perform (BLM, 1976, p. 2-18). Intense summertime thunderstorms can occur accompanied by high winds and rain that can measure several inches per hour. Local flash flooding can result. Tornadoes or large-scale severe storms are extremely rare.

3. Blythe to Midland. The Arizona, New Mexico, and Texas portions of the Pactex pipeline would follow fairly closely the same route as the All-American pipeline. A discussion of the meteorology and climatology section of the Arizona, New Mexico, and Texas portions of the pipeline follows.

A general description of the climate of this region can be compiled from information at various points along the route (BLM, 1984a, p. 3-4). Yuma, Arizona, is near the proposed California-Arizona border crossing of the pipeline system. Climate in Yuma is defintely of a desert type. Precipitation amounts are extremely small. In the late summer and fall, precipitation is generated by convective thunderstorms; in winter, by occasional west-to-east traveling frontal systems. Prevailing winds are northerly during the winter and southerly during the summer. The hot air rising above the intensely heated surface draws in moist air from the Gulf of Lower California so that humidity from mid-July to mid-September is higher than would be expected for a desert area. Temperature inversions are common at night throughout the year, but they persist further into the daytime hours during winter than in summer. Winds are strongest in summer and lightest in winter.

The proposed pipeline route would pass near Tucson in southeastern Arizona. This area is characterized by hot summers and mild winters. Total precipitation averages about 11 in. per year with the largest monthly totals during July and August, the period of maximum thunderstorm activity. Wintertime precipitation occurs as a result of passing frontal systems, but it averages less than 1 in. per month from December through February. The prevailing winds throughout the year are southeasterly with moderate speeds. Extreme winds near or above 40 knots can occur during any month and can generate substantial blowing dust.

The weather of El Paso, Texas, is indicative of the easternmost sections of the proposed pipeline route, including New Mexico and west Texas. The climate of the area is characterized by abundant sunshine throughout the year, high but not extreme daytime summer temperatures with very low humidity, light rainfall, and a relatively mild winter season that is typical of arid areas at low altitudes. About one-half of the annual 8 in. of precipitation in all forms occurs during the 3-month period from June through September, primarily from brief but sometimes intense thunderstorms with the potential for local

flooding. Small amounts of snow are received during most winters, but snowcover rarely amounts to more than 1 in. and seldom remains on the ground for more than a few hours.

The area can experience strong, gusty winds along with duststorms during any season. The latter are most common in March and April and comparatively rare from July through December. Visibility reductions to 6 miles typically occur about 40 hours a month during March. The prevailing winds are from the north during winter and from the south during summer with a fairly uniform average speed distribution except during the spring months.

Temperature and precipitation data for selected stations along the entire pipeline route are presented in Table 3.2.1-3.

C. Baseline Air Quality

The available air quality data for the period 1981-1983 for monitoring stations along or nearby the proposed Pactex pipeline is presented in this section. Tables 3.2.1-4 through 3.2.1-8 present relevant ambient monitoring data for stations located in the Los Angeles Basin, Arizona, New Mexico, and Texas.

Air quality in the South Coast Air Basin showed a marked overall improvement from 1975 to 1983, despite an increase in population of just over 1 million people. While the concentrations of some pollutants decreased substantially over the period, the improvement in air quality was more modest for other pollutants (SCAQMD, 1984a).

Table 3.2.1-3 - Proposed Pipeline Route: Summary of Temperature and Precipitation Data

Location	Mean Temperature (°F)				Average Annual Precipitation (in.)
	January		July		
	Max	Min	Max	Min	
California					
Long Beach	65	43	83	62	10.3
Los Angeles	67	47	83	64	14.1
Banning	58	37	95	57	12.4
Palm Springs	69	40	108	73	5.5
Blythe	66	41	108	81	3.2
Arizona					
Yuma	67	43	106	81	2.7
Phoenix	65	38	105	78	7.1
Tucson	64	38	98	74	11.1
New Mexico					
Deming	55	26	96	99	8.8
Texas					
El Paso	57	30	95	70	7.8
Midland Odessa	58	29	95	70	13.5

Source: NOAA, 1977.

Table 3.2.1-4 - South Coast Air Basin: Summary of Relevant Air Quality Data

Station/Year	O_3 (ppm)		NO_2 (ppm)		TSP (ug/m^3)		Max CO (ppm)		Max SO_2 (ppm)		Maximum (ug/m^3)	
	Max 1 hr	Mean Daily 1 hr	Max 1 hr	Annual Avg	Max 24 hr	AGM[a]	1 hr	8 hr	1 hr	24 hr	Sulfate (24 hr)	Lead (monthly average)
Long Beach												
1981	0.23	0.046	0.37[b]	0.054[b]	292	98.6[b]	13.0	11.3	0.14[b]	0.036[b]	32.7	1.22
1982	0.22	0.039	0.30	0.051	196	92.3[b]	14.0	11.6	0.09	0.029	30.4	1.09
1983	0.30	0.047	0.37	0.046	212	77.2[b]	14.0	12.1	0.12	0.038	30.8	1.08[b]
Lynwood												
1981	0.21	0.052	0.29[b]	0.053	376	113.3	31.0	25.3	0.09[b]	0.044[b]	24.0	1.83
1982	0.26	0.050	0.24	0.050	216	78.6	27.0	21.3	0.06	0.025	36.8	1.35
1983	0.23	0.060	0.27	0.046	232	82.4	24.0	20.9	0.06	0.039	27.6	1.36
Pico Rivera												
1981	0.35	0.093	0.36[b]	0.061[b]	269	121.2	15.0	11.9	0.05[b]	0.022[b]	27.1	1.59
1982	0.39	0.078	0.29	0.058	215	84.8[b]	13.0	11.9	0.05	0.024	30.8	1.18
1983	0.33	0.090	0.31	0.050	211	86.5	14.0	10.9	0.08	0.020	34.8	1.14
Pomona												
1981	0.33	0.088	0.31[b]	0.053[b]	ND	ND	12.0	9.6	ND	ND	ND	ND
1982	0.31	0.073	0.32	0.055	ND	ND	12.0	9.1	ND	ND	ND	ND
1983	0.34	0.087	0.21	0.052	ND	ND	15.0	8.0	ND	ND	ND	ND
Upland												
1981	0.36	0.112	0.20	0.049	261	113.9	14.0	6.9[b]	0.08[b]	0.031[b]	ND	ND
1982	0.32[b]	0.109[b]	0.20[b]	0.045[b]	161	105.8[b]	9.0	5.4	0.09[b]	0.025[b]	20.4	0.48[b]
1983	0.36	0.097	0.25	0.042	207	79.3	17.0[b]	8.7[b]	0.03	0.013	25.5	0.54
Fontana												
1981	0.35	0.117	0.19[b]	0.042[b]	372	125.8	15.0	7.6	0.11[b]	0.019[b]	42.4	0.52
1982	0.20[b]	0.048[b]	0.17[b]	0.029[b]	212	70.4	8.0	4.4	0.14[b]	0.019[b]	14.4	0.53
1983	0.32	0.100	0.16	0.034	273	95.2	10.0	5.1	0.06	0.014	33.1	0.39
San Bernardino												
1981	0.36[b]	0.127	0.17[b]	0.047[b]	295	129.2[b]	8.0[b]	5.0[b]	0.02[b]	0.011[b]	24.1	1.01
1982	0.30[b]	0.091	0.19	0.043	191	83.1	10.0	6.9	0.02[b]	0.011	29.6	0.62
1983	0.32	0.096	0.19	0.036	233	85.6	9.0	5.4	0.02	0.010	27.1	0.52
Yucaipa												
1981	0.27[b]	0.101[b]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1982	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1983	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Redlands												
1981	0.24	0.094	ND	ND	380	99.4[b]	6.0	4.9	ND	ND	31.0	0.47
1982	0.29	0.088	ND	ND	216	68.6	5.0	3.0	ND	ND	28.5	0.34
1983	0.30	0.090	ND	ND	250	77.3	4.0	3.0	ND	ND	24.1	0.32

[a]Annual geometric mean.
[b]Data presented is valid but incomplete; an insufficient number of valid data points was collected to meet EPA and/or ARB criteria for representativeness.
ND = no data.
Source: CARB, 1981, 1982, 1983.

Table 3.2.1-5 - Southeast Desert Air Basin: Summary of Relevant Air Quality Data

Station/Year	O_3 (ppm)		NO_2 (ppm)		TSP (ug/m^3)		Max CO (ppm)		Max SO_2 (ppm)		Maximum (ug/m^3)	
	Max 1 hr	Mean Daily 1 hr	Max 1 hr	Annual Avg	Max 24 hr	AGM[a]	1 hr	8 hr	1 hr	24 hr	Sulfate (24 hr)	Lead (monthly average)
Banning												
1981	0.23	0.068	ND	ND	271	80.7	ND	ND	ND	ND	19.6	0.26
1982	0.24	0.066	ND	ND	197	58.8	ND	ND	ND	ND	22.9	0.27
1983	0.26	0.070	ND	ND	201	58.7	ND	ND	ND	ND	20.1	0.24
Palm Springs												
1981	ND	ND	0.09	0.019	250	70.1	6.0	3.8	0.01	0.010	12.8	0.31
1982	0.19	0.070	0.15	0.025	129	43.9[b]	5.0	2.6	0.01	0.005	11.4	0.18
1983	0.19	0.069	0.16	0.027	159	50.1	7.0	2.8	0.01	0.010	13.3	0.16
Indio												
1981	ND	ND	ND	ND	228	83.2[b]	ND	ND	ND	ND	13.5	0.40[b]
1982	0.17	0.065	ND	ND	210	63.5	ND	ND	ND	ND	11.7	0.16
1983	0.18	0.067	ND	ND	305	82.7[b]	ND	ND	ND	ND	12.3	0.24[b]

[a]Annual geometric mean.
[b]Data presented is valid but incomplete; an insufficient number of valid data points was collected to meet EPA and/or ARB criteria for representativeness.
ND = no data.
Source: CARB, 1981, 1982, 1983.

Table 3.2.1-6 - Arizona: Summary of Relevant Air Quality Data

Station/Year	Max O_3 (ppm) 1 hr	NO_2 (ug/m3) Max 24 hr	NO_2 (ug/m3) Annual Avg	SO_2 (ug/m^3) Max 24 hr	SO_2 (ug/m^3) Annual Avg	TSP (ug/m^3) Max 24 hr	TSP (ug/m^3) AGM[a]	Max CO (mg/m^3) 1 hr	Max CO (mg/m^3) 8 hr	Lead (ug/m^3) Maximum Quarterly Average	Avg Sulfate (ug/m^3) Max 24 hr	Avg Sulfate (ug/m^3) Annual	Avg Nitrate (ug/m3) Max 24 hr	Avg Nitrate (ug/m3) Annual
Phoenix (S. General Stn)														
1981[b]	0.16	176	75	44	9	348	176	17	10	0.90	20.3	7.5	7.7	2.9
1982	0.03	249	67[c]	30	5[c]	252	121	16	10	0.70	12.3	5.0	10.2	3.1
1983	0.15	217	32	83	9	256	105	15	8	0.50	12.2	4.9	10.4	3.5
Coolidge														
1981	ND	40	13	74	4	253	92	ND	ND	0.13	ND	ND	ND	ND
1982	ND	28	16[c]	49	4	185	76	ND	ND	0.07[c]	ND	ND	ND	ND
1983	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maricopa														
1981	ND	33	7	17	2	155	54	3	1	0.08	ND	ND	ND	ND
1982	ND	19	7[c]	32	3	110	54[c]	ND	ND	0.06[c]	ND	ND	ND	ND
1983	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

[a]Annual geometric mean.
[b]The Phoenix E. Monroe Station was used for NO_2 and SO_2.
[c]Annual average based on a limited number of samples.
[d]The Phoenix E. Roosevelt Station was used for NO_2 and SO_2.
ND = no data.
Source: Arizona Department of Health Service, 1982, 1983, 1984.

Table 3.2.1-7 - New Mexico: Summary of Relevant Air Quality Data

Station/Year	Max O_3 (ppm) 1 hr	NO_2 (ug/m^3) Max 24 hr	NO_2 (ug/m^3) Annual Avg	SO_2 (ug/m^3) Max 24 hr	SO_2 (ug/m^3) Annual Avg	TSP (ug/m^3) Max 24 hr	TSP (ug/m^3) AGM[a]	Max CO (mg/m^3) 1 hr	Max CO (mg/m^3) 8 hr
Lordburg									
1980	ND	56	19	26	0	200	56	ND	ND
1981	ND	38	19	26	0	110	62	ND	ND
1982	ND	38	19	26	0	193	55	ND	ND
Deming									
1980	ND	56	38	0	0	178	70	ND	ND
1981	ND	38	38	26	0	134	70	ND	ND
1982	ND	38	19	26	0	262	60	ND	ND
Anthony[b]									
1980	0.10	56	19	0	0	391	114	13.0	6.3
1981	0.14	75	19	26	0	470	122	ND	ND
1982	0.10	38	19	26	0	369	107	ND	ND

[a]Annual geometric mean.
[b]Las Cruces station (No. 6W) substituted for CO, Las Cruces station (No. 60) for ozone.
ND = no data.
Source: New Mexico Health and Environmental Department, 1983.

Table 3.2.1-8 - Texas: Summary of Relevant Air Quality Data

Station/Year	Max O_3 (ppm) 1 hr	NO_2 (ppm) Max 24 hr	NO_2 (ppm) Annual Avg	SO_2 (ppm) Max 24 hr	SO_2 (ppm) Annual Avg	TSP (ug/m^3) Max 24 hr	TSP (ug/m^3) AGM[a]	Max CO (mg/m^3) 1 hr	Max CO (mg/m^3) 8 hr
Odessa									
1981	0.10	NS	0.01	0.00	0	250	59	16.3	5.1
1982	0.13	NS	0.01	0.01	0	402	71	13.5	5.5
1983	0.11	NS	0.01	0.01	0	161	53	10.8	6.2
El Paso[b] (downtown)									
1981	0.14	NS	0.03	0.11	0.03	ND	ND	25.3	15.7
1982	0.11	NS	0.02	0.13	0.03	249	90	18.7	12.7
1983	0.11	NS	0.01	0.01	0.00	190	87	10.8	6.2

NS = no standard in Texas.
ND = no data.
[a]Annual geometric mean.
[b]El Paso Health Department station total suspended particulates data is presented.
Source: Texas Air Control Board, 1984a,b.

3.2.2 GEOLOGIC AND SEISMIC SETTING

A. Physiography and Topography

1. POLA Area. The terminal facilities and proposed pipeline would begin at the proposed landfill island located about 0.5 mile offshore. A detailed description of the island design is given in Section 2. The island is proposed to rise 17 ft to 20 ft above the mean lower low water (MLLW) level. The Los Angeles Harbor area, located at the southern extent of the Los Angeles Basin, is a relatively flat coastal plain bounded to the west by the Palos Verdes Hills, an uplifted structural block that forms the peninsula jutting out into the ocean. Figure 2.2.1-5 shows the POLA area. The landward area of the harbor region is a highly urbanized flat plain drained by the channelized Los Angeles River. The general gradient in this area is 6 ft/mi. Beyond the shoreline, the general gradient of the ocean floor drops an average of 15 ft/mile, reaching 50-ft depths below the MLLW near the breakwater.

The present nearshore environment of the harbor has been completely altered from its predevelopment physiography. Figure 3.2.2-1 shows the present shoreline created by landfill versus the original environment prior to development. The modification of the San Pedro Bay area began during the 1800s when the bay was an estuary of the Los Angeles River and was composed of tidal marshes protected by an offshore bar called Rattlesnake Island. Over time, the development of the various harbor facilities required dredging, landfilling, and flood control channelization of Los Angeles River that has resulted in the present shoreline configuration. Rattlesnake Island was broadened to become Terminal Island, and the Los Angeles River was diverted into the consolidated slip channel situated in the harbor area between Los Angeles and Long Beach Harbors.

2. POLA to Blythe. The proposed pipeline would cross from POLA north and east to Blythe, California, prior to crossing the Colorado River into Arizona. This section of the route would be located in the Pacific border physiographic province, which includes the Peninsular and Transverse Ranges (Figure 3.2.2-2). The route would begin in the broad low-lying Los Angeles Basin of the Peninsular Range, characterized by gently sloping valley floors occasionally interrupted by steep-sided hills created by masses of near-surface bedrock. The Puente Hills, which separate the main basin from the eastern subbasin, rise about 1,000 ft above the adjacent valley floor. The route would pass over the Peninsular Range and skirt the Transverse Range before moving into the basin and range province.

The pipeline would enter the Basin and Range Province when it reaches the Colorado Desert (Salton Trough) region. The Colorado Desert is a closed fault-formed basin with internal drainage and moderate relief. The route would rise to an elevation of 2,000 ft before dropping into the Whitewater and Coachella River Valleys. The route would continue through the Colorado Desert near the Indio Hills and into the Chuckwalla Valley, described as either within the southernmost portion of the Mojave Desert or the westernmost portion of the Sonoran Desert, both subdivisions of the Basin and Range Province. The Chuckwalla Valley is at about 800 ft in elevation. The

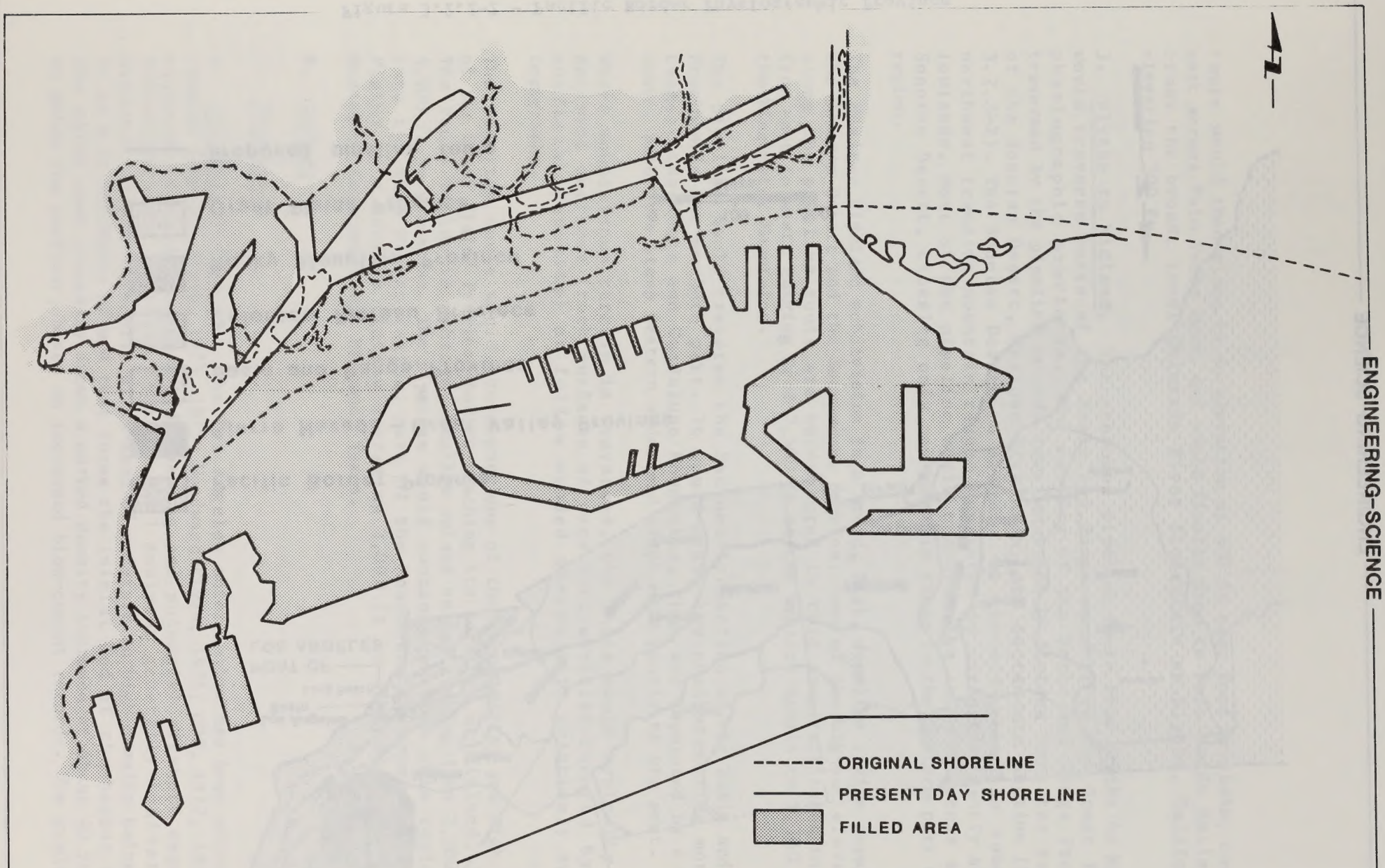


Figure 3.2.2-1 - Present Landfill Shoreline versus Original Environment
(COE, 1984, p. 69)

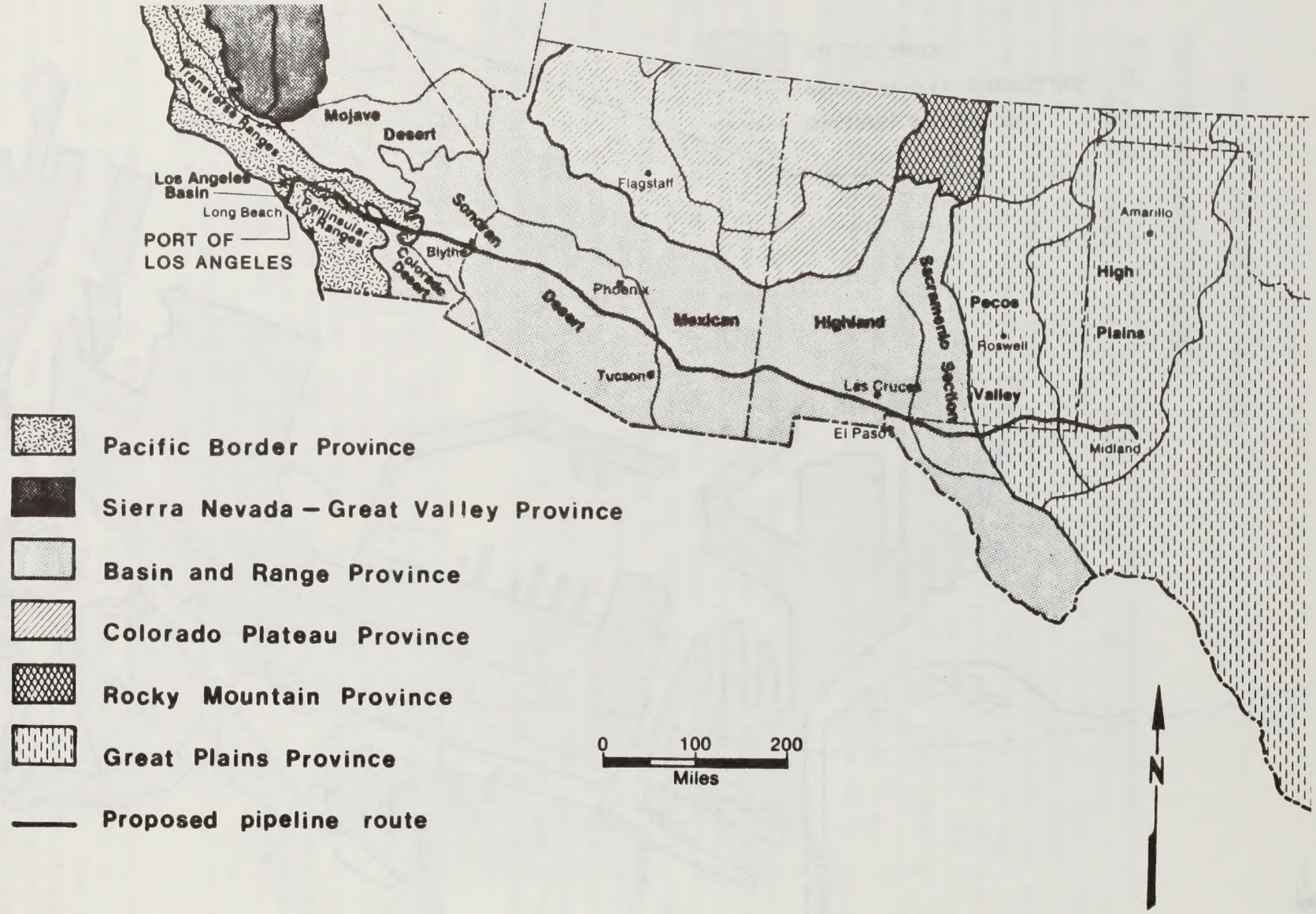


Figure 3.2.2-2 - Pacific Border Physiographic Province
(BLM, 1976, p. 2-42)

route would then slope to an elevation of 400 ft near Ford Dry Lake, continue east across Palo Verde Mesa, and would finally drop to Palo Verde Valley and cross the broad, level Colorado River floodplain at Blythe, California, elevation 300 ft.

3. Blythe to Midland. The proposed pipeline route from Blythe to Midland would traverse parts of the Basin and Range as well as the Great Plains physiographic provinces. The section of the Basin and Range Province traversed by the pipeline extends into Texas and is divided into the regions of the Sonoran Desert, Mexican Highlands, and Sacramento Section (Figure 3.2.2-2). The Sonoran Desert in Arizona is characterized by numerous northwest trending mountain ranges separated by extensive, gently sloping lowlands. Most of the pipeline would traverse the lowlands areas of the Sonoran Desert, crossing only one mountain range in the western part of the region.

The Mexican Highland subdivision is a broad, high, domelike region separating the Sonoran Desert and the Sacramento Section. Some of the highest elevations along the pipeline route are encountered in this area; altitudes increase from east to west, ranging from 2,500 ft at the western margin to 5,300 ft in the Winchester Mountains.

The pipeline would traverse the Sacramento Section of the Basin and Range Province in its southern part. It would cross two north-trending mountain ranges, the Hueco and Guadalupe Mountains, that are separated by a closed basin. Both have steep western sides and slope more gently to the east.

Where mountainous terrain is traversed, the route would typically cross pediment surfaces (rock surfaces of very little relief covered by thin surficial deposits) or follow eroded passes with relatively subdued topography.

The pipeline route would cross portions of the Pecos Valley and High Plains of the Great Plains Province before reaching its terminal at Midland, Texas. The Pecos Valley is a broad, shallow upland valley ranging from 2,900 ft to 4,000 ft in elevation. The pipeline would continue through this region and into the High Plains region, part of the Mescalero Escarpment. The High Plains is a uniform plateau averaging 3,000 ft in altitude between the Mescalero Escarpment and Midland, Texas.

B. Geology

1. POLA Area.

a. Offshore Sediments. The Los Angeles outer harbor has been extensively sampled (Dames & Moore, 1973, 1975; Woodward-Clyde, 1975; COE, 1977, 1978) in support of harbor channel deepening and potential offshore expansion investigations. Borehole data and soil analyses generally indicate the presence of predominantly silty-sand of moderate to high density below the 2 ft to 4 ft thickness of mud that forms the initial bed of the harbor floor. The silty sand generally shows a marked density increase at about 40 ft to 50 ft below the seafloor, based on increased blow-coount records. The grain size

and the percentage of sand vary slightly between boring locations but generally show a trend of greater silt and mud size sediments landward toward Terminal Island.

b. Stratigraphy. Information on the geology of the harbor and general Los Angeles Basin area has been derived principally from studies of bedrock exposures on structural highs such as the Palos Verdes Hills and Santa Catalina Island, well data, geophysical surveys, and offshore bottom sampling. The general geology of the project vicinity is shown in Figure 3.2.2-3, and typical stratigraphic columns for the Los Angeles Harbor area are illustrated in Figure 3.2.2-4.

The basement complex underlying the region consists of rock units of Jurassic or Late Cretaceous age. The Newport-Inglewood structural zone (northeast of the harbor area) juxtaposes two different basement assemblages (Yerkes et al., 1965). The basement rocks and overlying stratigraphic units on only the southeast side of the Newport-Inglewood zone are discussed here.

Southwest of the Newport-Inglewood fault zone, the basement complex is composed of a metamorphic rock assemblage known as the Catalina Schist. This complex has been encountered in several areas and is thought to underlie most of the southern California borderland (Platt, 1976). In certain areas, the Catalina Schist is overlain by as much as 20,000 ft of Miocene and younger sedimentary and volcanic rocks (Yerkes et al., 1965). Tertiary rocks of Paleocene, Eocene, and Oligocene age have not been reported in this area.

In the Palos Verdes Hills area, the metamorphic basement rocks are overlain by siliceous, phosphatic, and diatomaceous shales and mudstones of middle to late Miocene age assigned to the Monterey formation. Sandstones and volcanic tuffs have also been reported within the upper members of the Monterey formation in this area (Woodring et al., 1946).

Strata of Pliocene age occur throughout most of the area southwest of the Newport-Inglewood structural zone. In the harbor area, the Pliocene series is represented by the Repetto and Pico formations. The Repetto formation, a lower Pliocene unit composed primarily of massive siltstone, varies in thickness from approximately 1,000 ft to 4,000 ft. The upper Pliocene Pico formation, comprising predominantly siltstone and sandstone, unconformably overlies the Repetto formation, reaching a maximum thickness of about 1,000 ft in the harbor area (Woodring et al., 1946; Yerkes et al., 1965).

Marine gravels, sands, and clays of the lower to middle Pleistocene San Pedro formation occur northwest of the harbor. The deposits are lithologically diverse, consisting predominantly of marl, silt, sand, and gravel; they range in thickness up to about 1,000 ft. They are unconformably overlain by unnamed upper-Pleistocene marine deposits consisting of shallow marine sands and silts that reach a maximum thickness of 150 ft to 250 ft in the harbor area.

Recent deposits in the region comprise channel cut-and-fill gravels and sands of the ancestral Los Angeles River. During the last major worldwide fall of sea level, the river incised the upper Pleistocene marine deposits to depths

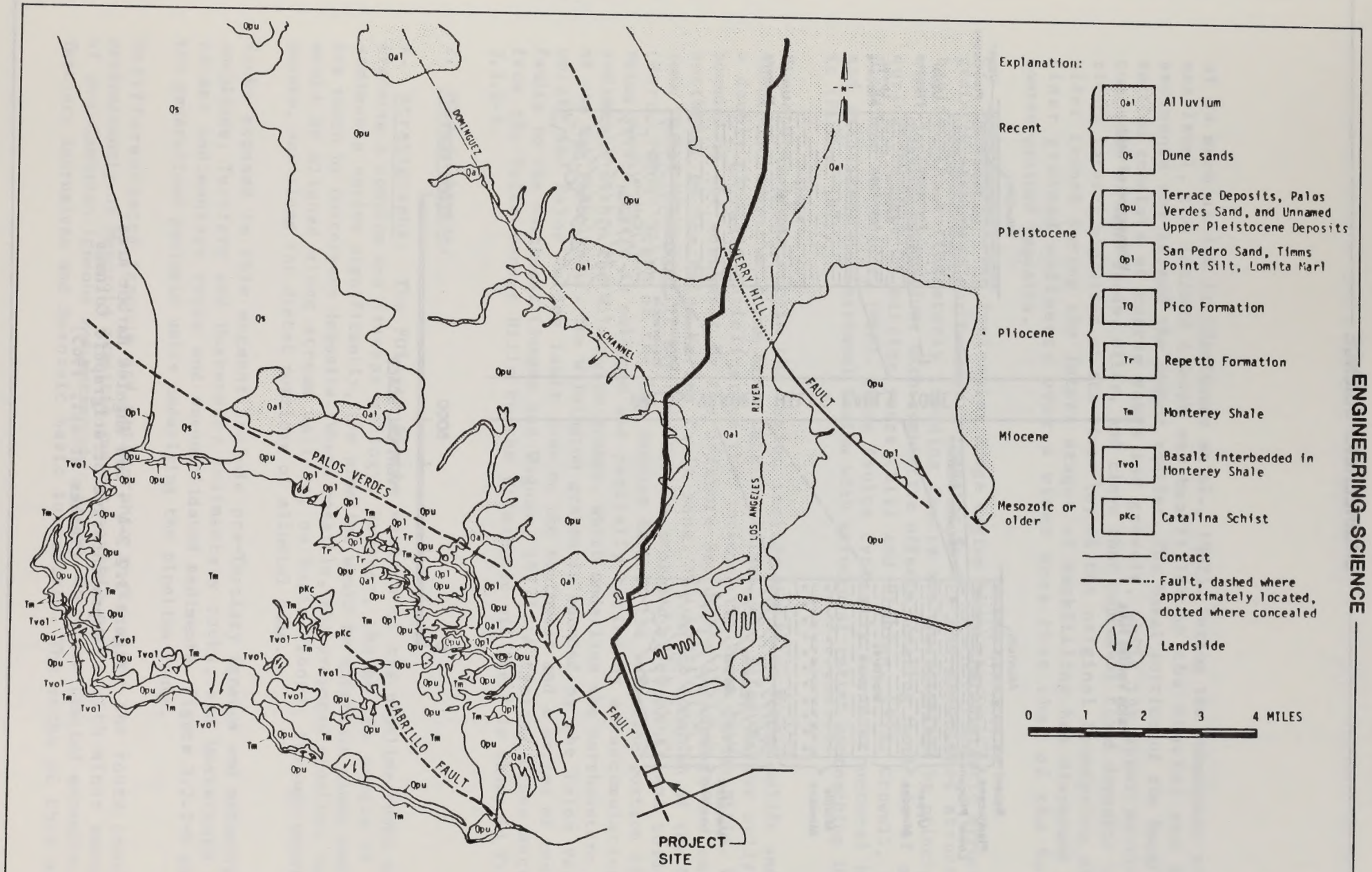


Figure 3.2.2-3 - Los Angeles Harbor Area: General Geology
(Schoellhamer et al., 1954)

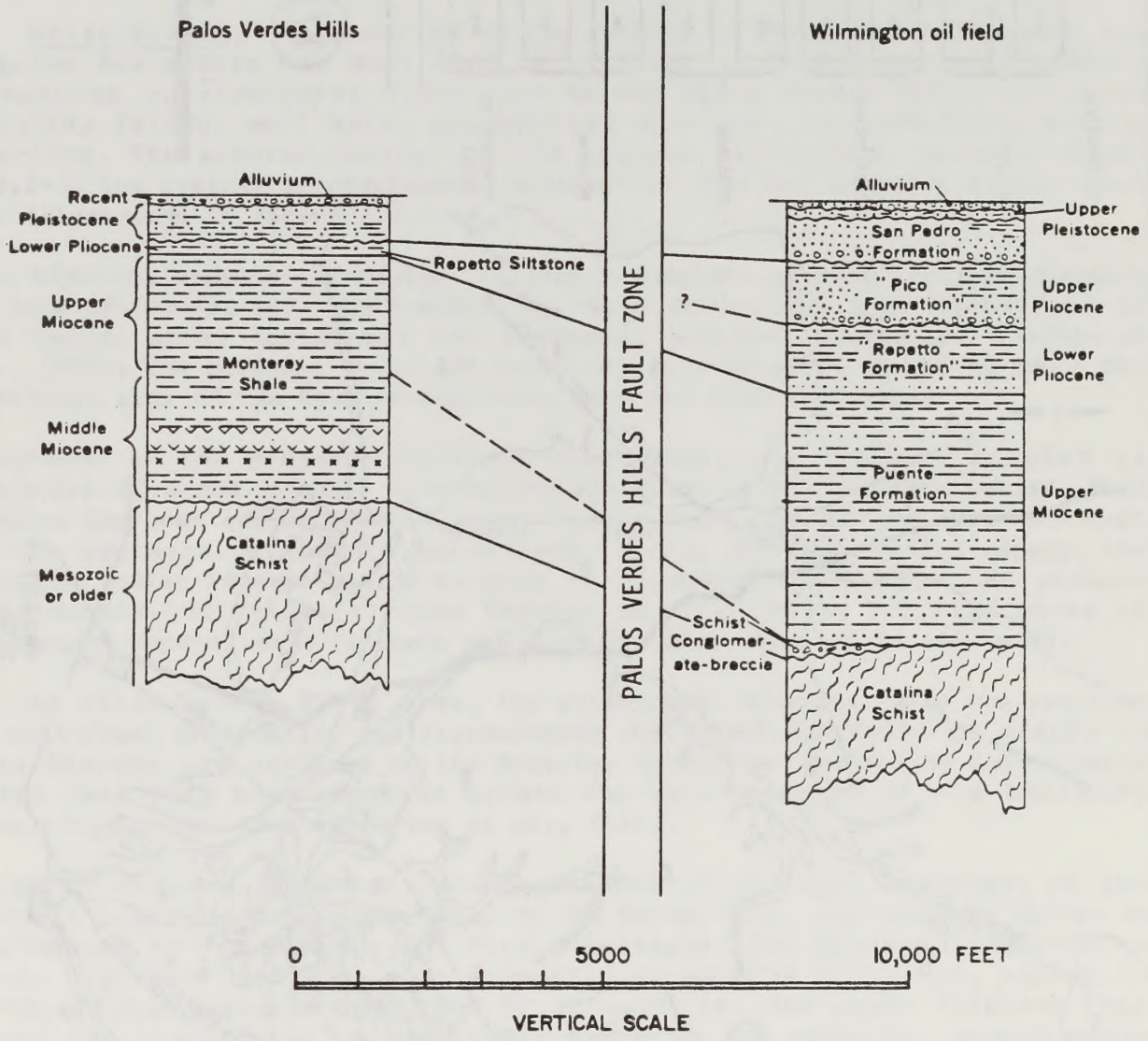


Figure 3.2.2-4 - Los Angeles Harbor Area:
Representative Stratigraphic Columns
(Yerkes et al., 1965)

of as much as 180 ft (Zielbauer et al., 1962). During the subsequent rise of sea level, the incised trench was backfilled by the fluvial and marsh sediments now termed the Gaspur aquifer. The basal portion of the backfilled section consists of coarse sands and gravels, while the upper portion is composed of fine sands, silts, and clays that represent flood deposits of the river. Lateral migration of the river beyond the original boundaries of the older trench during the latest stages of backfilling has dispersed these finer grained sediments over a wider area than that of the basal, coarse-grained deposits.

c. Structure. The Peninsular Range region has a characteristic structural grain consisting of northwesterly trending faults and associated structural basins. The northwesterly trending faults are characterized by principally right-lateral separation, with cumulative offsets totaling hundreds of miles during the past 25 million years (Hill and Dibblee, 1953; Crowell, 1962; Dickinson and Grantz, 1968). These faults typically bound structural highs and associated depositional basins with structural relief approaching 20,000 ft (Parker, 1971).

Structural highs within the region include the Palos Verdes uplift and the submarine ridge that forms Santa Catalina Island. The Palos Verdes uplift is a doubly plunging anticlinorium that includes the Palos Verdes Hills. It is bounded on the southwest by the offshore San Pedro escarpment and on the northeast by the Palos Verdes fault zone. The exact location of the fault zone is not known, but it may underlie the proposed offshore island terminal (Hart, 1980). South of the Los Angeles Harbor, the submarine portion of the Palos Verdes uplift is onlapped and partially buried by an accumulation of sediments within the Wilmington graben, which underlies the northeastern part of the San Pedro shelf. The Wilmington graben is bounded by the Palos Verdes uplift and Palos Verdes fault zone on the southwest and a series of unnamed faults to the northeast (Junger and Wagner, 1977). A typical cross section from the Palos Verdes Hills to the Wilmington oil field is shown in Figure 3.2.2-5.

2. POLA to Blythe.

a. Stratigraphy. The POLA-to-Blythe section of the pipeline route would traverse a complex and diverse geology. However, though the origin of the sediments varies significantly, the pipeline would be underlain along most of its reach by Quaternary deposits. Where possible, the proposed pipeline route would be aligned along stream valleys, on basin floors, through mountain passes, and along the distal portions of alluvial fans.

Rocks exposed in this segment include pre-Tertiary igneous and metamorphic complexes, Tertiary and Quaternary sedimentary rocks, and Quaternary and recent sedimentary rocks and unconsolidated sediments. Figure 3.2.2-6 shows the generalized geologic units underlying the pipeline route.

Undifferentiated igneous and metamorphic rocks along the route consist predominantly of Mesozoic granitic and metamorphic rocks with minor amounts of pre-Cambrian igneous and metamorphic rocks. There are limited exposures of Tertiary intrusives and Mesozoic basic intrusives. The rocks of this unit

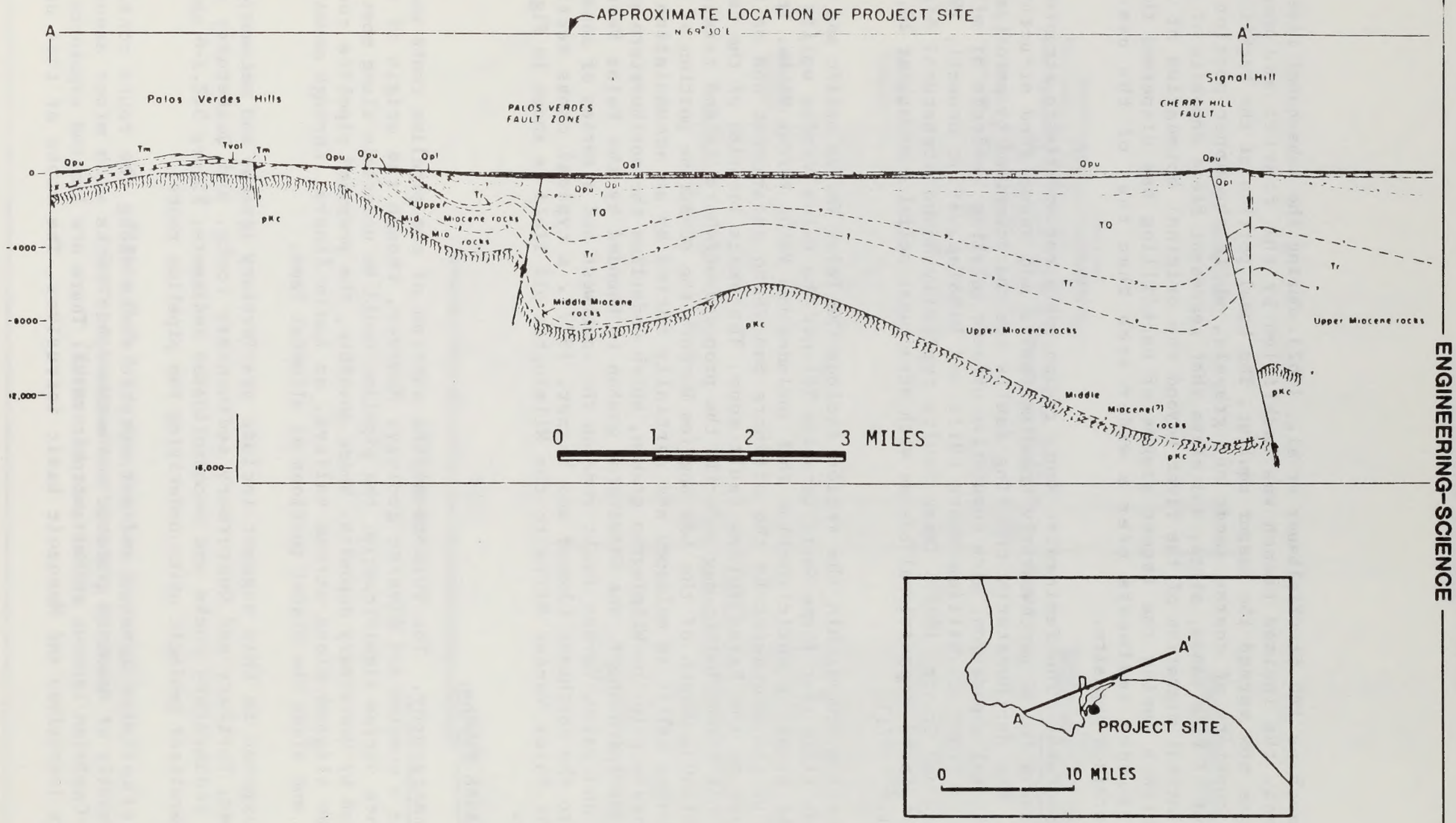


Figure 3.2.2-5 - Los Angeles Harbor Area: Structural Section
(Shoellhamer et al., 1954)

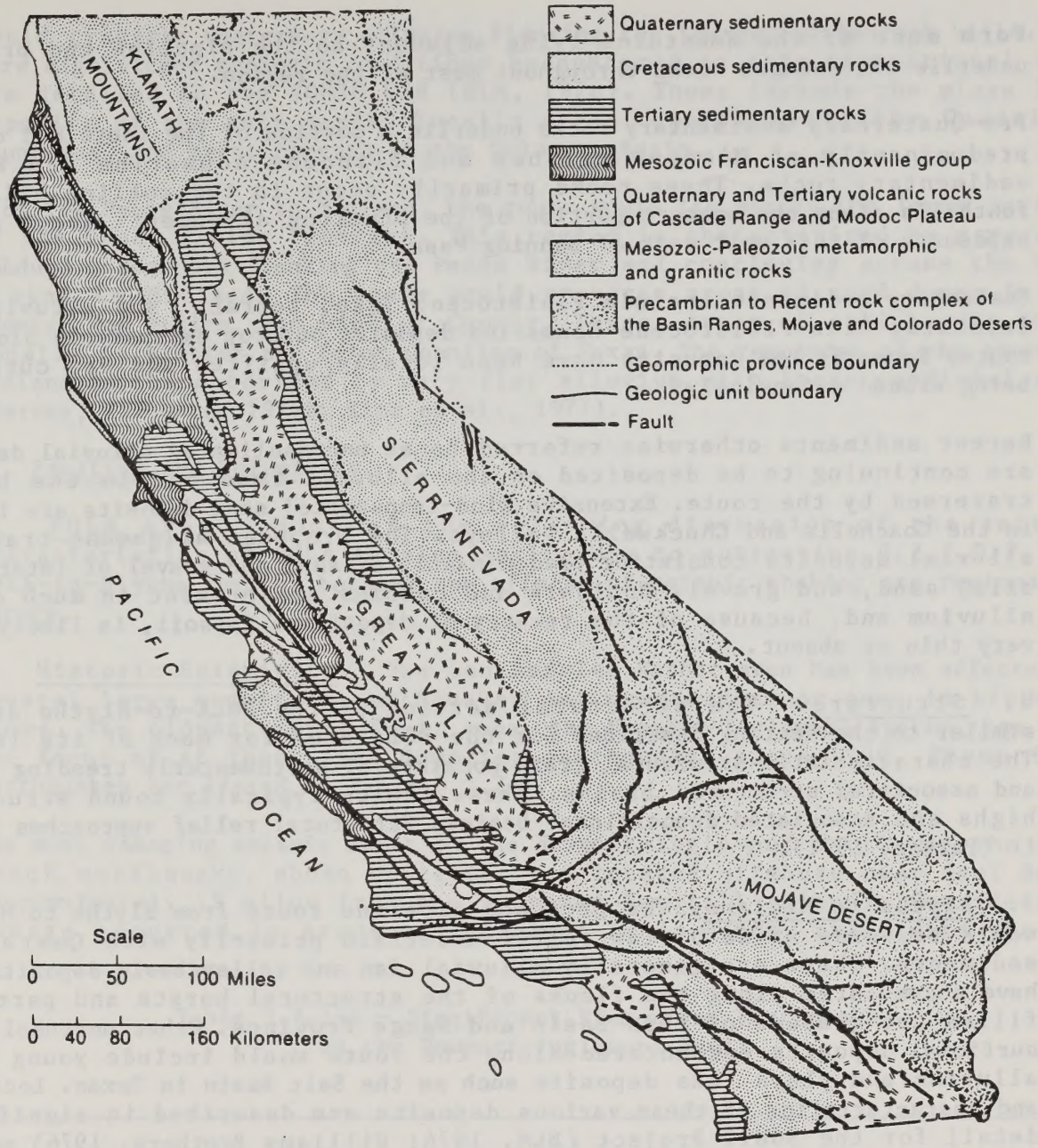


Figure 3.2.2-6 - POLA to Blythe: General Geology
(Norris and Webb, 1976)

form most of the mountains lying adjacent to the pipeline and probably underlie the younger rocks throughout most of the region.

Pre-Quaternary sedimentary rocks underlie a portion of the route and consist predominantly of Miocene marines and Pliocene nonmarine and Eocene sedimentary rocks. These rocks primarily occur in the rolling hills and foothills along the western portion of the pipeline alignment. There are no exposures of this unit east of Banning Pass.

Quaternary sediments include Pleistocene lake, terrace, and alluvial fan deposits; Plio-Pleistocene nonmarine deposits outcrop extensively along the route. Recently the deposits have been locally uplifted and are currently being eroded extensively.

Recent sediments otherwise referred to as unconsolidated alluvial deposits are continuing to be deposited on the alluvial fans and in the basins traversed by the route. Extensive wind-transported sand deposits are located in the Coachella and Chuckwalla Valleys. The proposed alignment traverses alluvial deposits consisting predominantly of sand and gravel of interbedded silt, sand, and gravel. Boulders and cobbles are present in much of the alluvium and, because of the recency of deposition topsoil, is likely to be very thin or absent.

b. Structure. The structural setting of the POLA-to-Blythe area is similar to the setting described for the POLA area for much of its length. The characteristic structural grain consists of northwesterly trending faults and associated structural basins. These faults typically bound structural highs and associated depositional basins. Structural relief approaches 50,000 ft (Parker, 1971).

3. Blythe to Midland. The proposed pipeline route from Blythe to Midland would traverse areas of low relief underlain primarily with Quaternary sediments. There are generally alluvial fan and valley/basin deposits that have accumulated along the flanks of the structural horsts and partially filled the grabens of this Basin and Range Province. Other unconsolidated surficial deposits encountered along the route would include young river alluvium and playa lake deposits such as the Salt Basin in Texas. Locations and characteristics of these various deposits are described in significant detail for the SOHIO Project (BLM, 1976; Williams Brothers, 1976) and for part of the route, in the Palo Verde-Devers EIS (BLM/NRC, 1978).

Bedrock occurs at or near the surface in a number of locations along the route within the Basin and Range Province. These include mountain ranges, Quaternary lava flows, and pediments that flank many of the deeply eroded mountain ranges. Areas of rock outcrop and pediments would be traversed in areas such as the Delaware Mountains as shown in the EIS for the SOHIO Project (BLM, 1976).

Between the Hueco Mountains and the Pecos River, the proposed route would pass through a transitional zone between both the Basin and Range and the Great Plains Provinces. Rock outcroppings occur locally; most of the route

would traverse Quaternary alluvium flanking the low-relief bedrock hills. The more significant geologic conditions encountered in this transitional zone are detailed in the SOHIO EIS (BLM, 1976). These include the playa lake deposits of the salt basin, locally steep topography in the Guadalupe Mountains, and karst terrain in the Delaware Basin.

From the Pecos River to Midland, the route would lie within the Texas portion of the Great Plains Province. This region is characterized by generally subdued topography flanking the Pecos River and continuing across the high plains to Midland. The route would traverse areas of sand dunes in Lea County, New Mexico, and Winkler County, Texas. Areas of caliche are found locally in Winkler and Ector Counties of Texas. The remainder of the route to Midland is characterized by very flat alluvium with loose surficial sand (Barnes, 1976a and 1976b; Kier et al., 1977).

C. Faulting and Seismicity

1. POLA Area. Most of the following discussion of the seismic characteristics of POLA is also applicable to subsection 3.2.2.C.2, the POLA-to-Blythe region, because the effects of seismic shaking are regional in nature.

a. Historic Seismicity. The Los Angeles Harbor area has been affected by several large magnitude earthquakes and numerous minor ones in historic times. The closest major fault zone, the Newport-Inglewood system, has been the focus of at least five damaging earthquakes since 1920. These five earthquakes are listed in Table 3.2.2-1.

The most damaging seismic event on the Newport-Inglewood fault was the Long Beach earthquake, whose epicenter was located offshore near Seal Beach (approximately 15 miles from the proposed landfill island). Considerable damage occurred in areas of reclaimed land, marshy areas with shallow

Table 3.2.2-1 - Significant Historical Earthquakes on the Newport-Inglewood Fault

Location	Year	Epicentral Intensity (Modified Mercalli)	Magnitude (Richter)
Inglewood	1920	VIII	4.9
Long Beach	1933	IX	6.3
Santa Monica	1940	VI	4.7
Gardena	1941	VII	4.9
Torrance	1941	VIII	5.4

Source: Coffman and Von Hake, 1973.

groundwater, and areas characterized by poor quality construction (Eppley, 1966). No direct evidence of surface faulting was recorded, although fissures and evidence of lurching were observed in soft sediment zones along the onshore portion of the Newport-Inglewood fault.

The harbor area will be potentially affected not only by historically active faults in close proximity but also by seismic events focused in any of the major active and potentially active faults in southern California as shown in Figure 3.2.2-7. Table 3.2.2-2 lists the seismic characteristics of the active and potentially active faults.

Palos Verdes is the closest fault underlying the harbor area inside the breakwater. The exact location of this fault's trace is not confirmed, but it is thought to lie close to the proposed landfill island (Greene et al., 1975). Darrow and Fischer (1983) show the northeasternmost segment of the fault to be located approximately 1,000 ft west of the proposed island. The historic seismicity (from 1901-1979) of the major faults in southern California is shown in Figure 3.2.2-8.

b. Significant Faults. The major southern California fault systems capable of having a significant, strong, ground-shaking effect on the harbor area and on the California section of the proposed pipeline in general are listed below.

i. San Andreas Fault Zone. The San Andreas fault system is the principal surface manifestation of seismicity and tectonism in southern California resulting from the northward motion of the Pacific plate relative to the North American plate (Crowell, 1968; Atwater, 1970; Allen, 1975). At its closest approach, the San Andreas fault is located about 55 miles from the proposed site. The San Andreas is generally characterized as a right-lateral strike-slip fault, with cumulative offsets on the combined San Andreas/San Gabriel fault zones totaling 185 miles since late Miocene time (Crowell, 1962 and 1975). Maximum cumulative slip along the southern section of the San Andreas fault during Holocene time is estimated at approximately 400 ft. Estimates of current slip rates near Highland, California (approximately 60 miles north by northwest of the proposed crossing), is given as 1 in./year (Clarke et al., 1984).

Two of California's three great historic earthquakes (the 1887 Fort Tejon and the 1906 San Francisco events) occurred on the San Andreas fault. A recurrence interval of approximately 125 to 225 years has been estimated for large events occurring on the San Andreas fault near Palmdale, and a comparable rate of earthquake occurrence has been postulated for the segment of the fault to the southeast, near San Bernardino (Raleigh et al., 1982). Consequently, this fault must be considered as a potential source for strong ground motion in the harbor area.

ii. Newport-Inglewood Structural Zone. The Newport-Inglewood fault is located approximately 6 miles northeast of the harbor area and is a major seismogenic structure in the Los Angeles basin. The fault trends northwest from Newport Mesa to the Cheviot Hills, where it apparently terminates

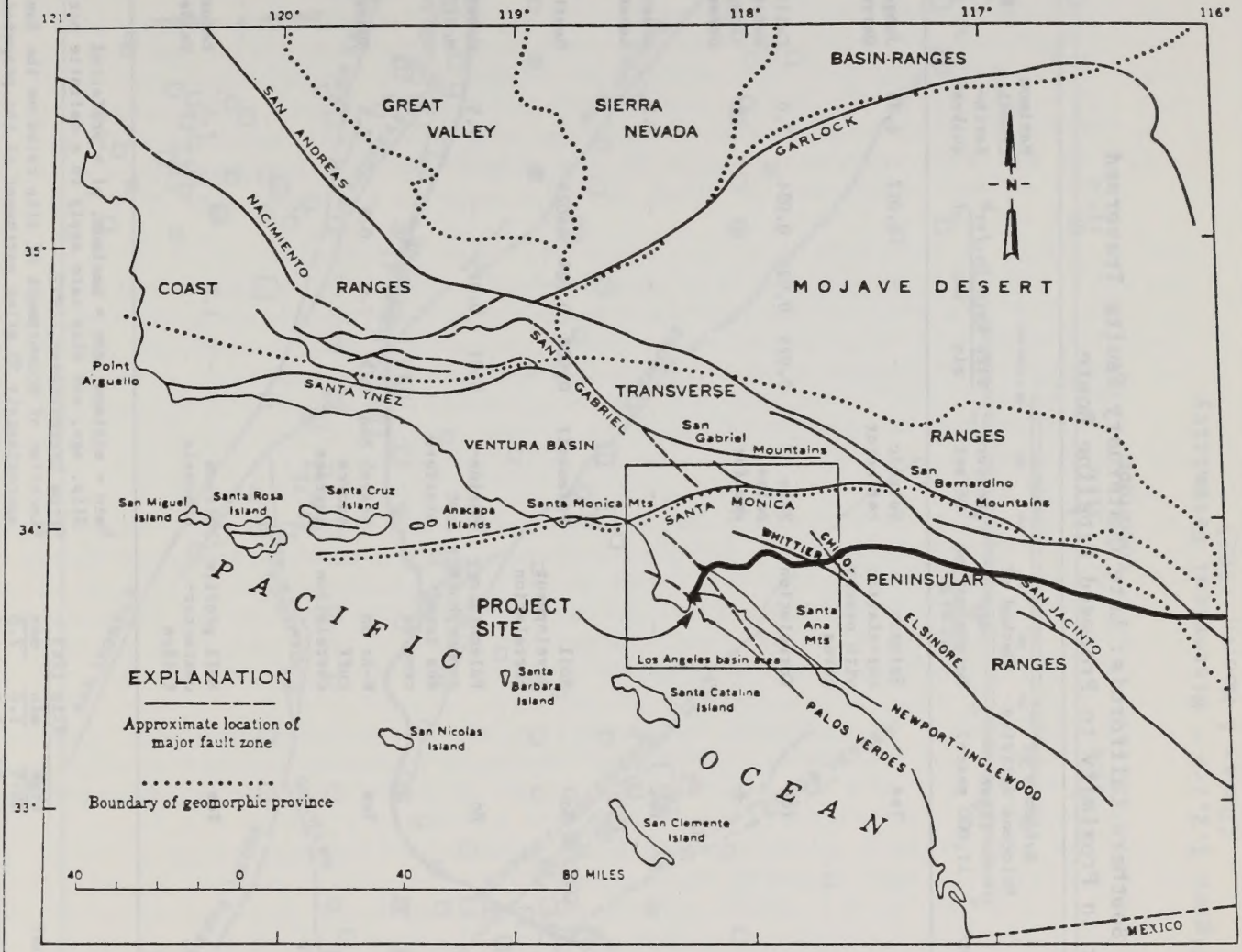


Figure 3.2.2-7 - Southern California: Active and Potentially Active Faults (Yerkes et al., 1965)

Table 3.2.2-2 - Southern California: Late Quaternary Faults Traversed or in Proximity to Proposed Pipeline Route

Fault Name	Location	Pipeline Traverses Fault	Style Component[a]	Evidence of Holocene Activity (last 11,000 years)	Method of Age Determination	Feature Offset	Slip Rate in./yr[b] min	max	pf	Maximum Credible Earthquakes[c]	Reference
Palos Verdes Hills Fault Zone	Inner San Pedro Shelf	No	RR*:V	Yes	Seismic correlation with nearby cores	Seismic reflector	-	-	0.012	6.75	Junger & Wagner, 1977 Darrow & Fischer, 1983
Newport-Inglewood Structural Zone (north branch)	Bolsa Gap	Yes	RV*:V	Yes	Correlation	Base of Bolsa aquifer	0.024	0.024	0.024	7.0	California Dept. of Water Resources, 1968 Ziony et al., 1974 Greensfelder, 1972
Whittier-Elsinore Fault Zone	San Gabriel Valley	Yes	-	Yes	-	-	-	-	-	7.5	Greensfelder, 1972 Lamas, 1978
Chino Fault Trace	Prado Dam Trenches	Yes	RR*:V	No	Soil development correlation	Paleosoil	0.008	0.024	0.024	-	Heath et al., 1974
Santa Monica	Petrero Canyon Area	No	R*:V	No	Paleontology geomorphology sea level records	Marine-cut platform	0.01	0.015	-	7.5	McGill, 1981 McGill, 1982
San Jacinto Fault Zone: Clark Extension, Loma Linda Segment	Anza Valley	Yes	RV:Hs	Yes	K-Ar on tuff correlation	Gravel bed source terrace	0.3	1.0	0.5	7.5	Sharp, 1981
San Andreas[d]	Elder Gulch Highland Area	Yes	RL:Hs	Yes	Soil profile characteristics	Stream channels	-	1.0	-	7.5	Ramussen, 1982 Welden & Sieh, 1980

[a] Possible Components

Strike-slip: RL = right lateral; LL = left lateral

Dip-slip: R = reverse or thrust, compressional; N = normal, extensional

Oblique-slip: RR = right-reverse; LR = left-reverse; RN = right-normal; LN = left-normal; RV = right-vertical; LV = left-vertical

*Indicates some degree of uncertainty in determination.

Type	Slip (ft) min	max
RR:V	1.6	2.8
Hd	1.2	4.6
Hs	1.2	36
Ts	2.8	37

[b] min = minimum; max = maximum; pf = preferred
Slip, age, and slip rate apply to a definite period in the past.

[c] From Greensfelder, 1972.

[d] Location of measurement of slip rates on the San Andreas is approximately 50 miles northwest of the proposed pipeline crossing.

Source: Modified from Clark et al., 1984.

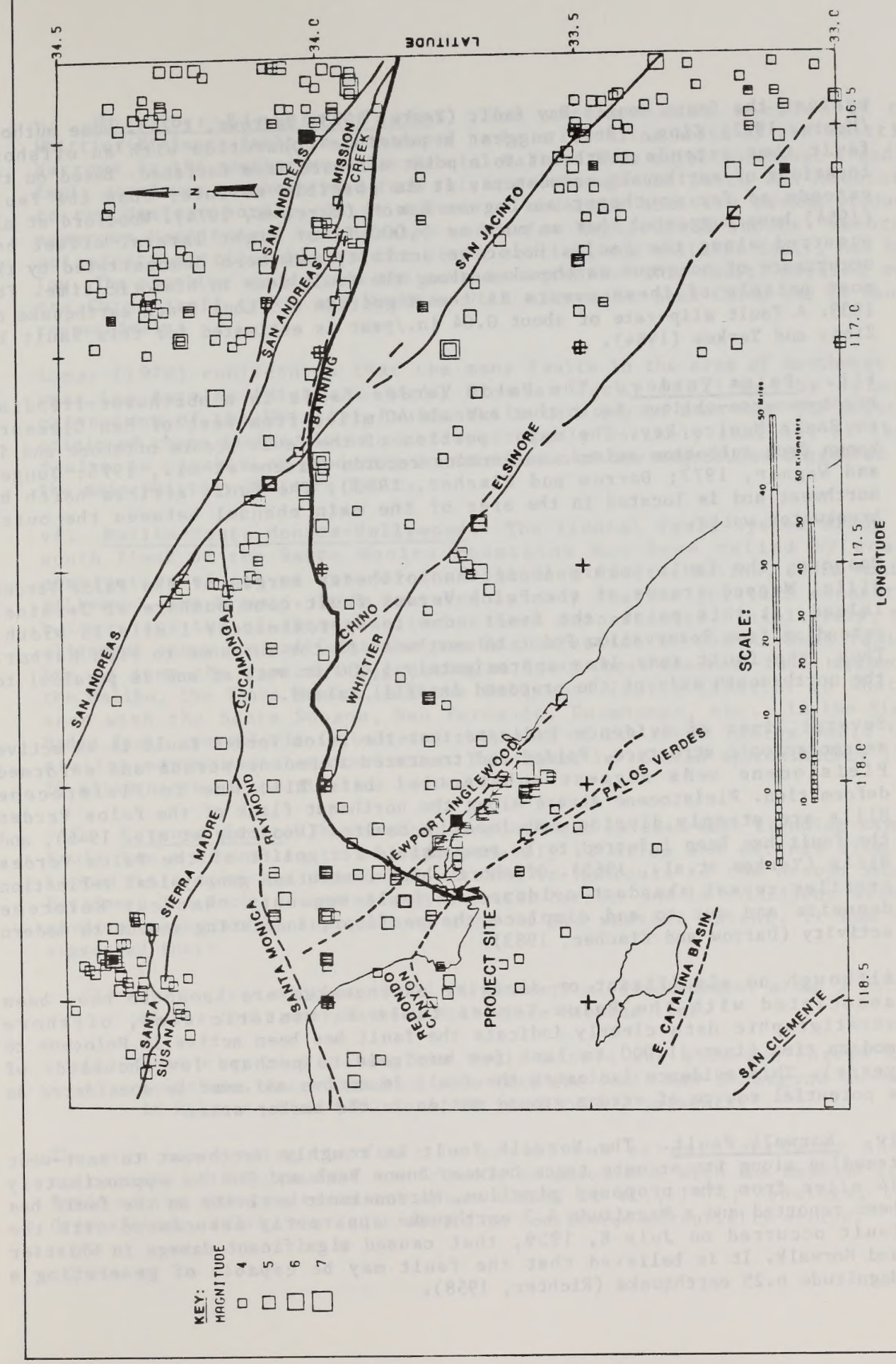


Figure 3.2.2-8 - Historical Seismicity
(Dames & Moore, 1982)

against the Santa Monica Bay fault (Yeats, 1973; Barrows, 1974). Some authors (Moore, 1972; King, 1969) suggest a possible connection with an offshore fault that extends southeast to a point offshore from Carlsbad. Based on the locations of earthquake epicenters, it is possible to infer that the fault extends as far southeast as Laguna Beach (Barrows, 1974). Woodford et al. (1954) have suggested that as much as 5,000 ft of right lateral offset has occurred along the fault. Holocene activity has been demonstrated by the occurrence of numerous earthquakes along the fault zone in historic time. The most notable of these events is the Magnitude 6.3 Long Beach earthquake of 1933. A fault slip-rate of about 0.04 in./year is estimated for this fault by Ziony and Yerkes (1984).

iii. Palos Verdes. The Palos Verdes fault is a northwest-trending right-reverse-oblique fault that extends 40 miles from west of San Clemente to Santa Monica Bay. The major portion of the fault occurs offshore and is known from subbottom seismic reflection records (Greene et al., 1975; Junger and Wagner, 1977; Darrow and Fischer, 1983). The fault strikes north by northwest and is located in the area of the main channel between the outer breakwater walls.

Onshore, the fault occurs along the northeast margin of the Palos Verdes Hills. Mapped traces of the Palos Verdes fault come onshore at Terminal Island. At this point, the fault zone is approximately 1 mile in width, extending from Reservation Point to northwest of the entrance to Fish Harbor. Thus, the fault zone lies approximately 1,000 ft west of and is parallel to the north-south axis of the proposed landfill island.

Several lines of evidence indicate that the Palos Verdes fault is an active seismotectonic structure. Folded and truncated Pliocene strata and deformed Pleistocene beds suggest substantial late Pliocene to Pleistocene deformation. Pleistocene strata along the northeast flank of the Palos Verdes Hills are steeply dipping and locally faulted (Woodring et al., 1946), and the fault has been inferred to be responsible for uplift of the Palos Verdes Hills (Yerkes et al., 1965). Offshore, high-resolution geophysical reflection profiles reveal abundant evidence of fault segments that cut Holocene deposits and cut to and displace the seafloor, indicating recent to modern activity (Darrow and Fischer, 1983).

Although no significant or damaging earthquakes are known to have been associated with the Palos Verdes fault in historic time, offshore stratigraphic data clearly indicate the fault has been active in Holocene to modern time (last 11,000 to last few hundreds to perhaps few thousands of years). This evidence indicates the fault is active and must be considered as a potential source of strong ground motion in the harbor area.

iv. Norwalk Fault. The Norwalk fault is roughly northwest to east-west trending along its arcuate trace between Buena Park and Tustin approximately 14 miles from the proposed pipeline. Microseismic activity on the fault has been reported and a Magnitude 4.7 earthquake apparently associated with the fault occurred on July 8, 1929, that caused significant damage in Whittier and Norwalk. It is believed that the fault may be capable of generating a Magnitude 6.25 earthquake (Richter, 1958).

v. Whittier-Elsinore Fault. The northernmost section of the Whittier-Elsinore fault is considered to be a few miles north of the Whittier Narrows in the southernmost San Gabriel Valley. This major northwest-trending fault continues southeastward from this area through the Santa Ana Mountains to the Mexican border. It is a zone of moderate activity having produced numerous Magnitude 4 earthquakes and a few Magnitude 5 shocks. Recorded seismicity attributable to the north section, the Whittier fault, has been low. The pipeline would cross the northern extent of this fault, passing over the Chino fault trace and Workman Hill extension near Chino and El Monte, respectively.

Lamar (1970) conjectures that the many faults in the area of southwest and west Los Angeles (Highland Park, Elysian Park, etc.) may be splayed extensions of the Whittier fault. While this may be true from the point of origin of these faults, it is considered highly unlikely that any of these faults is capable of producing an earthquake of the magnitudes suggested for the main Whittier-Elsinore fault.

vi. Malibu-Santa Monica-Hollywood. The frontal fault system along the south flank of the Santa Monica Mountains has been called by some a combination of one or more of the following faults: Malibu, Santa Monica, Hollywood, and Raymond. It is believed by many that no physical connection between any two of these faults has been demonstrated. Intuitively, this alignment seems logical (with the possible exception of the Raymond fault), but so does the approach suggesting at least three discrete fault segments, the Malibu, the Santa Monica, and the Hollywood faults (similar to what is seen with the Santa Susana, San Fernando, Cucamonga, etc., in the Sierra Madre fault system). It is believed that each of the three faults would have similar earthquake characteristics. This fault is located approximately 15 to 20 miles north of the pipeline route.

vii. Raymond fault. The northeast-southwest to east-west trending Raymond Fault has a known length of approximately 11 miles and extends from the foothills of the San Gabriel Mountains in Monrovia to the Arroyo Seco in Pasadena. The fault serves as a groundwater barrier and is coincident with an obvious topographic scarp along much of its western extent. It has been suggested that:

(1) There is a minimum of 222 ft of vertical displacement along a portion of the fault near Raymond Hill since Miocene time.

(2) That clay gouge along the fault within the alluvium serves as an aquiclude. Recent studies show that the fault has undergone movement in Holocene time (200 to 3,000 years before present).

The area surrounding the fault is one of low seismic activity and no epicenters of Magnitude 4 can clearly be associated with the Raymond fault. Based on the above criteria and others (Ziony et al., 1974; Jennings, 1975; Greensfelder, 1974), the fault should be considered potentially active.

viii. Sierra Madre Fault System. The Sierra Madre fault system (located approximately 20 miles north of the proposed pipeline route and 30 miles from the POLA) is predominantly reverse dip-slip, characteristic of faults of the transverse range system. The fault generally dips to the north at about 60 degrees. The north side of the fault has been uplifted approximately 5,000 ft relative to the south side. The boldness of the scarp along the mountain front argues for the geologic recency of activity on the fault. Evidence gathered during construction of the Glendora Tunnel (Proctor et al., 1970) suggests at least 700 ft of reverse (thrust) movement since the beginning of Quaternary time.

The Sierra Madre fault system appears to be a series of independent, arcuate segments. The total length of the combined fault segments is approximately 64 miles as measured on CDMG "Geologic Map of California," Los Angeles (1969) and San Bernardino (1969) Sheets. The individual segments range from 9 miles to 20 miles in length, extending from Lytle Creek (near San Bernardino) at the east end of the Cucamonga fault to, and including, the west end of the San Fernando fault at Weldon Canyon. These segments seem to have a relative independence insofar as earthquakes are concerned [i.e., 1969 earthquake on Cucamonga fault (Lamar et al., 1973); 1971 San Fernando earthquake on the San Fernando fault]. The name and length of the fault segments comprising the Sierra Madre fault system are:

Name of Fault Segment	Location	Fault Length (miles)
San Fernando	Weldon Canyon to Big Tunjunga Canyon	12
La Canada	Big Tujunga Canyon to Arroyo Seco Canyon	9
Sierra Madre	Arroyo Seco Canyon to Monrovia Canyon	11
Duarte	Monrovia Canyon to San Dimas Canyon	12
Cucumonga	San Dimas Canyon to Lytle Creek	20

The San Fernando fault is the westerly segment of the Sierra Madre fault system (see above, Sierra Madre Fault System, for expanded description) located approximately 27 miles from the POLA. The 12-mile-long San Fernando fault, located between Big Tujunga Canyon and Weldon Canyon (near the intersection of Balboa Boulevard and Weldon Canyon, Sylmar, California) is an east-west trending thrust and left-lateral fault. The fault ruptured during the February 9, 1971, San Fernando earthquake (Magnitude 6.4). Approximately 9 miles of ground-surface rupture occurred on little-known preexisting faults in an area of low seismicity and previously unknown ground displacements. The maximum vertical displacement was approximately 5 ft. The San Fernando fault has been well studied and much has been published since the earthquake (Bonilla, 1970; Barrows et al., 1971; Lamar et al., 1973.

ix. San Jacinto Fault. The San Jacinto fault is a northwest trending complex series of right-lateral faults extending from the eastern San Gabriel Mountains south through the Borrego Valley (southwest of the Salton Sea). Seismically one of the most active fault zones in the state, the San Jacinto has been the origin of many small and moderately large historic earthquake shocks. Ground-surface displacement has occurred along the fault, the most

recent being in Borrego Valley in San Diego and Imperial Counties on April 8, 1968, during a Magnitude 6.5 earthquake (Hileman et al., 1973). The fault is located about 50 miles from POLA and would be crossed by the pipeline near Colton.

Recent studies of the San Jacinto fault near San Bernardino by the University of California at Riverside have more clearly defined the location and recency of activity of the fault in that area, as well as data that may be used to derive recurrence intervals for this section of the fault.

c. Future Seismicity. Based on the historical record, it can be inferred that the Los Angeles Harbor area will be affected by earthquakes in the future. The estimated maximum credible earthquakes listed in Table 3.2.2-2, however, are independent of time and do not reflect the probability of occurrence.

d. Fault Displacement. A fault is a fracture or plane of weakness in the earth's crust along which the opposite sides have been relatively displaced. Such fault displacements can occur at any depth in the crust; when they occur at the surface, they may present a hazard to overlying structures.

The General Plan of the City of Los Angeles includes the Seismic Safety Plan as one of its elements (Los Angeles, 1975). The policies and programs of this plan are intended to provide direction for the city and its departments concerning geologic and seismic events. One feature of the plan establishes Fault Rupture Study Zones. The plan recommends engineering geologic and soils engineering investigations of these areas. A Fault Rupture Study Zone is mapped within the harbor where the Palos Verdes fault passes through the area.

Darrow and Fischer (1983) mapped a segment of the Palos Verdes fault as underlying an area close to the landfill island project site (see Figure 3.2.2-3). This particular segment is the northeasternmost fault segment within an approximate 1-mile-wide zone of deformation and displaces the seafloor, forming a low scarp 3 ft to 5 ft in height (Darrow and Fischer, 1983). Based on the location of the fault segment with respect to the site and evidence for modern activity along its trace, the potential for surface fault rupture is considered to exist along this trace. The rupture would be within the dredged channel but not within the fill area.

Dames & Moore (1982) recently evaluated the earthquake recurrence and probability of surface rupture along the Palos Verdes fault based on long-term slip rates along the fault for a nearby facility in Los Angeles Harbor. Results of this investigation indicated a 10% to 20% probability of about 2 in. to 4 in. of displacement and 2% to 5% probability of 8 in. to 16 in. of displacement in a 50-year facilities lifetime. These estimates were for the entire 40-mile length of the fault and would be significantly smaller for a particular point along the fault.

There are no other recorded faults that would pose a displacement hazard to the site.

e. Liquefaction and Other Effects of Ground Motion. The effects of strong ground motion triggers various types of ground failures. These include landsliding, liquefaction, lateral spreading, lurching, differential settlement, and bedrock shattering. All of these involve a displacement of the ground surface caused by loss of strength or failure of the underlying materials during earthquake shaking. Liquefaction is a process in which granular sediments are altered from a solid to a liquefied state as a result of increased pore-water pressure caused by repeated cycles of dynamic loading. Liquefaction by itself poses no particular hazard, but it can present a problem to engineered structures when it leads to permanent ground deformation or to structural failure resulting from lateral spreading or loss of bearing capacity. Soils most susceptible to liquefaction are loose, clean, water-saturated, fine-grained sands within roughly 50 ft to 60 ft of the ground surface (Sowers, 1979). Seismically induced liquefaction may occur during earthquakes with magnitude greater than 5.0 (Coppersmith, 1982).

Liquefaction has occurred during several historic southern California earthquakes including the 1971 San Fernando, the 1952 Kern County, and the 1933 Long Beach events. During the latter earthquake, severe structural damage was caused by local ground deformation in areas with shallow groundwater such as Compton and the southern portion of Long Beach near Seal Beach (approximately 5 miles to 15 miles from the POLA site).

The phenomenon of soil liquefaction requires the simultaneous occurrence of three conditions:

(1) The presence of loose to medium dense sand and/or silty sand materials.

(2) A saturated condition, with the water table within approximately 50 ft of the ground surface.

(3) Cyclic loading of greater than about 0.2 g and of relatively long duration.

Only when cyclic loading occurs within saturated susceptible materials can liquefaction occur. Based on these characteristics, estimated susceptibility to liquefaction is shown in Table 3.2.2-3.

Lateral spreading results in a dominantly horizontal displacement of flat-lying alluvial material toward an open or free face, such as the steep bank of a stream channel. This movement is caused by failure, perhaps liquefaction, of one or more layers of alluvium exposed in the free face.

Lurching, also referred to as ground fissuring or ground cracking, results in fracturing and chaotic displacement of the ground surface. Muddy or sandy water often erupts from these cracks as fountains or sheets, producing sand boils. This may result in local subsidence and further ground fracturing (Bonilla, 1970). Lurch cracks also may be caused by local liquefaction of subsurface material.

Differential settlement, also referred to as consolidation subsidence, results in uneven settling of the ground surface, and may be accompanied by

Table 3.2.2-3 - Estimated Susceptibility of Sedimentary Deposits to Liquefaction During Strong Seismic Shaking (by age of deposit)[a]

Type of Deposit	500 Years	Holocene	Pleistocene	Pre-Pleistocene
Continental				
River channel	Very high	High	Low	Very low
Flood plain	High	Moderate	Low	Very low
Alluvial fan and plain	Moderate	Low	Low	Very low
Marine terrace and plain	-	Low	Very low	Very low
Delta and fandelta	High	Moderate	Low	Very low
Lacustrine and playa	High	Moderate	Low	Very low
Colluvium	High	Moderate	Low	Very low
Dune	High	Moderate	Low	Very low
Coastal Zone				
Delta	Very high	High	Low	Very low
Estuarine	High	Moderate	Low	Very low
Beach (high wave energy)	Moderate	Low	Very low	Very low
Beach (low wave energy)	High	Moderate	Low	Very low
Lagoon	High	Moderate	Low	Very low
Foreshore	High	Moderate	Low	Very low
Artificial				
Uncompacted fill	Very high	-	-	-
Compacted fill	Low	-	-	-

[a]Likelihood that cohesionless sediments, when saturated, would be susceptible to liquefaction.
Source: Youd and Perkins, 1978.

local eruption of muddy or sandy water. Similar to lurching, this process may be caused by local liquefaction or differential compaction of alluvium or colluvium during earthquake shaking. Each of these forms of ground failure either requires or is intensified by high water content and the presence of structurally weak materials.

Bedrock shattering can occur in hard bedrock on hillsides during earthquakes. These multiple bedrock cracks are often concentrated along narrow ridge crests between deep valleys. These cracks are probably the result of intensification of ground shaking amplitude along narrow ridge crests. Such bedrock shattering occurred in the San Gabriel Mountains during the 1971 San Fernando earthquake (Barrows et al., 1971). The theoretical basis for, and field measurement of, this bedrock-shattering topographic effect is described by Rogers et al. (1974).

Relative displacement of the ground surface along a fault trace can be horizontal, vertical, or a combination of both, depending on the type of displacement along the fault plane. Vertical displacement is involved in normal and thrust faults. Horizontal (strike-slip) displacement is involved in right-lateral and left-lateral faults.

Direct effects of horizontal displacement will be restricted generally to the fault zone forming the boundary between the moving land masses. The direct effects of vertical displacement will be most noticeable in shoreline areas. The secondary effects of vertical movement (accelerated erosion and deposition) will be noticed throughout the displacement area.

Tectonic creep is long-term gradual displacement along a fault and is generally not accompained by felt earthquakes. Of the faults crossed by the proposed pipeline in California, the San Andreas and San Jacinto faults show the greatest evidence of fault creep (Ziony and Yerkes, 1984; Clark et al., 1984).

f. Tsunamis. The California coastline and POLA are subject to tsunamis, long-period waves resulting from seismic activity at sea. The 1960 Chilean earthquake (Magnitude 8.3) resulted in a 6.1-ft-high wave measured at Terminal Island. Most of the damage from this event occurred to boats and harbor facilities in Cerritos Channel and resulted from seiche movements associated with it. The potential damaging effect of tsunamis is significantly reduced by the Palos Verdes Hills and harbor breakwaters.

2. POLA to Blythe.

a. Historical Seismicity. Southern California is a seismically active area as shown by the historical records available over the last 150 to 200 years and instrumental seismic records for about the last 50 years. Table 3.2.2-2 and Figures 3.2.2-7 and 3.2.2-8, which were presented in the previous subsection, show which faults would be crossed by the proposed pipeline route and what the historical activity of these faults has been.

b. Significant Faults. The faults capable of sustaining damage to the pipeline have been described in the section covering the POLA area (subsection 3.2.2.C.1.b), because these faults could also potentially affect the harbor area. All nine of the fault zones listed, with the exception of the Santa Monica, Raymond, and Sierra Madre fault systems, would be traversed by the proposed pipeline alignment between the POLA area and Blythe. Of these, the Newport-Inglewood, Whittier-Elsinore, San Jacinto, and San Andreas faults are zoned for special studies under the Alquist-Priolo Special Studies Report of 1972. These faults are deemed capable of fault-rupture hazards (Hart, 1980).

c. Future Seismicity. Based on the historical record as described, it can be inferred that the probability of a major earthquake occurring along one of the significant faults described, in the design lifetime of the pipeline, is high. The maximum credible earthquakes associated with the major faults are listed in Table 3.2.2-3, and the recurrence intervals of the major fault systems were discussed in the subsection 3.2.2.C.1.

Peak acceleration potential on given faults is an important design criterion for structures in the fault zone. A recent study by Thenhaus et al. (1980) provided a perspective concerning the maximum probable potential for horizontal ground motion, or peak acceleration. This investigation gives probabilistic estimates of maximum horizontal ground motion on routes in California for return periods of 100, 500, and 2,500 years. The peak acceleration maps for the 100- and 500-year return periods are shown in Figures 3.2.2-9 and 3.2.2-10, respectively. However, this study did not evaluate the peak acceleration potential for southeastern California. Table 3.2.2-4 gives the probable strong ground-motion estimates by Thenhaus et al. (1980).

Table 3.2.2-4 - Summary of Probabilistic Strong Ground-Motion Estimates

Return Period	Acceleration	
	Maximum on Rock (g)	Adjusted[a] (g)
100 years	0.3 to 0.5	0.2 to 0.35
500 years	0.5	0.35

[a]Acceleration adjusted for site-specific soils conditions using the relationship of Seed et al. (1976).
Source: Modified from Thenhaus, et al., 1980

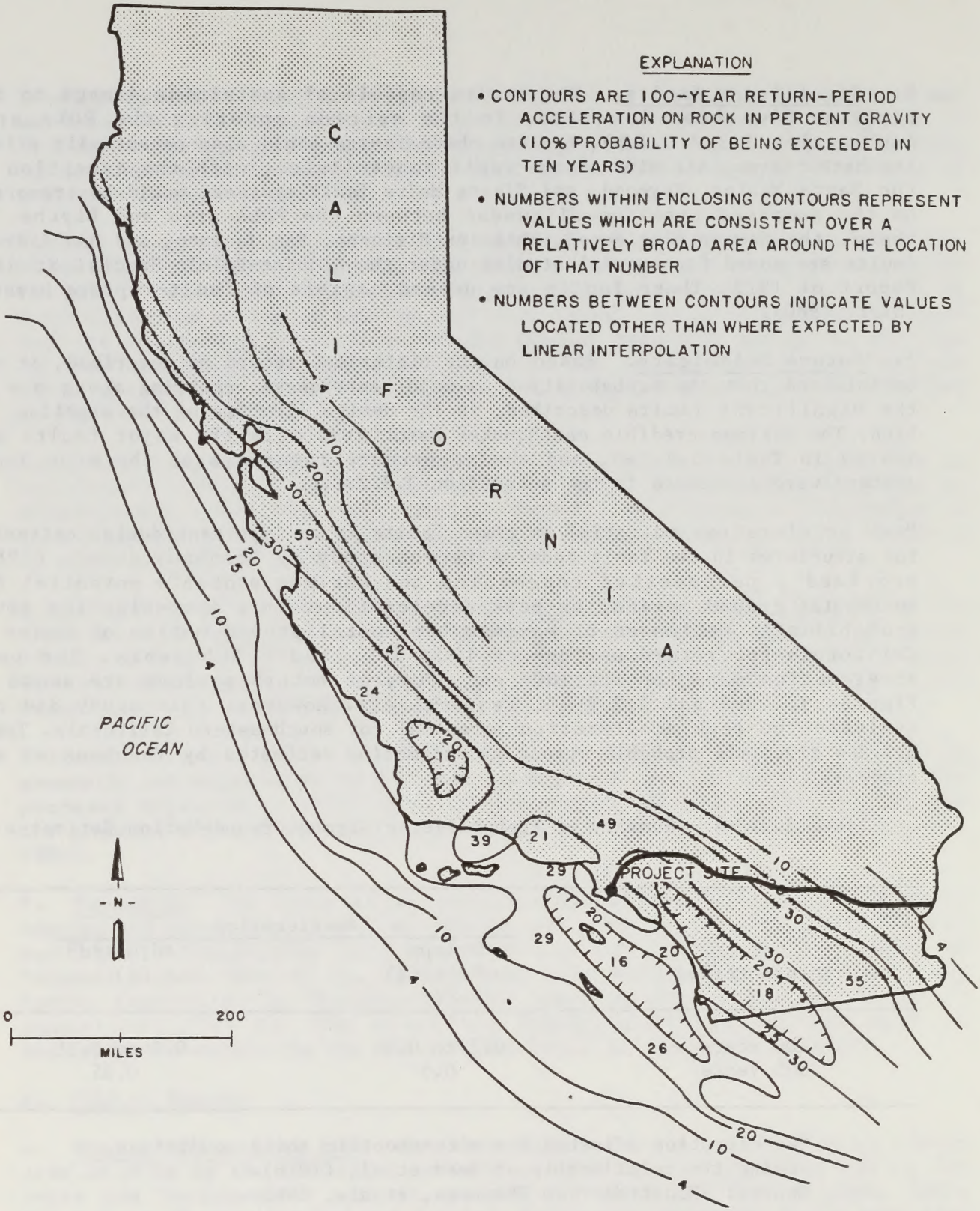


Figure 3.2.2-9 - Coastal California: 100-Year Return Period Acceleration (Thenhaus et al., 1980)

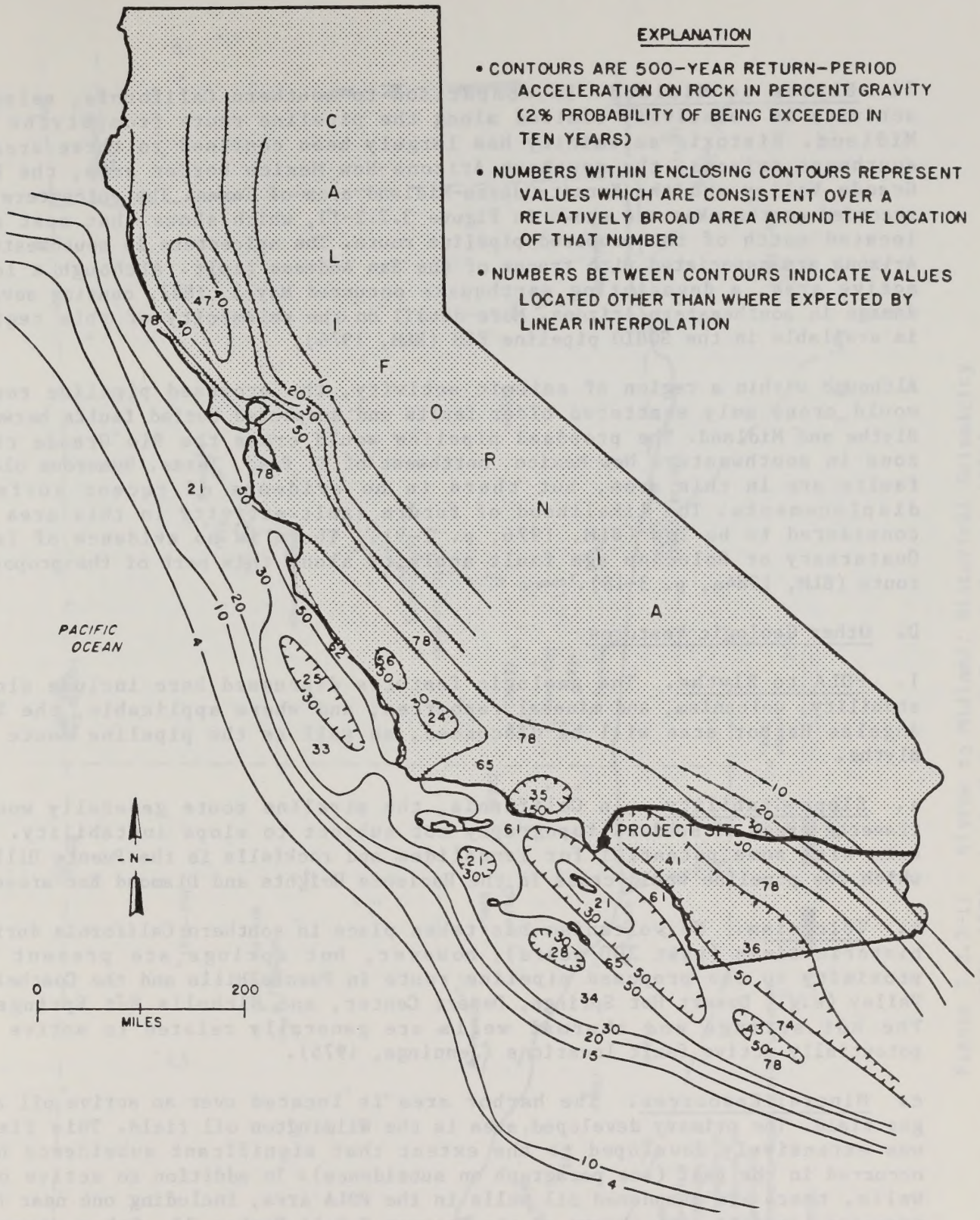


Figure 3.2.2-10 - Coastal California: 500-Year Return Period Acceleration (Thenhaus et al., 1980)

3. Blythe to Midland. In comparison to southern California, seismic activity is relatively limited along the pipeline route from Blythe to Midland. Historic seismicity has largely been confined to three areas: southwest Arizona, the southern Arizona-New Mexico border area, the Rio Grande Valley and the Kermit-Odessa-Midland area of Texas. The epicenters of recorded earthquakes are shown in Figure 3.2.2-11, which shows that most are located north of the proposed pipeline route. The epicenters in southwestern Arizona are associated with traces of the San Andreas fault. Although a less active area, a devastating earthquake occurred May 3, 1887, causing severe damage in southeastern Arizona. More detail on the seismicity of this region is available in the SOHIO pipeline EIS (BLM, 1976).

Although within a region of seismic activity, the proposed pipeline route would cross only scattered older faults and suspected buried faults between Blythe and Midland. The proposed pipeline would cross the Rio Grande rift zone in southwestern New Mexico, northwest of El Paso, Texas. Numerous older faults are in this area, but there is no evidence of recent surface displacements. The likelihood of future fault activity in this area is considered to be low (BLM, 1976, p. 2-91). There is no evidence of late Quaternary or Holocene age fault activity along this part of the proposed route (BLM, 1984a, p. 3-18).

D. Other Geologic Features

1. POLA to Blythe. The geologic features discussed here include slope stability, volcanism, and mineral resources; and where applicable, the Los Angeles Harbor area will be discussed, as well as the pipeline route to Blythe.

a. Slope Stability. In California, the pipeline route generally would traverse areas of subdued topography not subject to slope instability. An area with some potential for landslides and rockfalls is the Puente Hills, which the pipeline would cross in the Hacienda Heights and Diamond Bar areas.

b. Volcanism. No volcanism has taken place in southern California during historic times (past 200 years); however, hot springs are present in proximity to the proposed pipeline route in Puente Hills and the Coachella Valley (e.g., Desert Hot Springs, Desert Center, and Nicholls Hot Springs). The hot springs and thermal wells are generally related to active or potentially active fault locations (Jennings, 1975).

c. Mineral Resources. The harbor area is located over an active oil and gas field. The primary developed area is the Wilmington oil field. This field was extensively developed to the extent that significant subsidence has occurred in the past (see paragraph on subsidence). In addition to active oil wells, there are abandoned oil wells in the POLA area, including one near the proposed landfill site (known as the Chevron S-P LA Harbor 2). Other mineral resources affected by the harbor development would be the rock quarries used for island dike construction. The most likely source of rock are quarries on Santa Catalina and inland quarries such as those in the Jurupa Mountains in Riverside or another near Carpinteria. Based on an analysis of rock size distribution, most of the large rock will probably come from Santa Catalina Island (Woodward-Clyde, 1975).

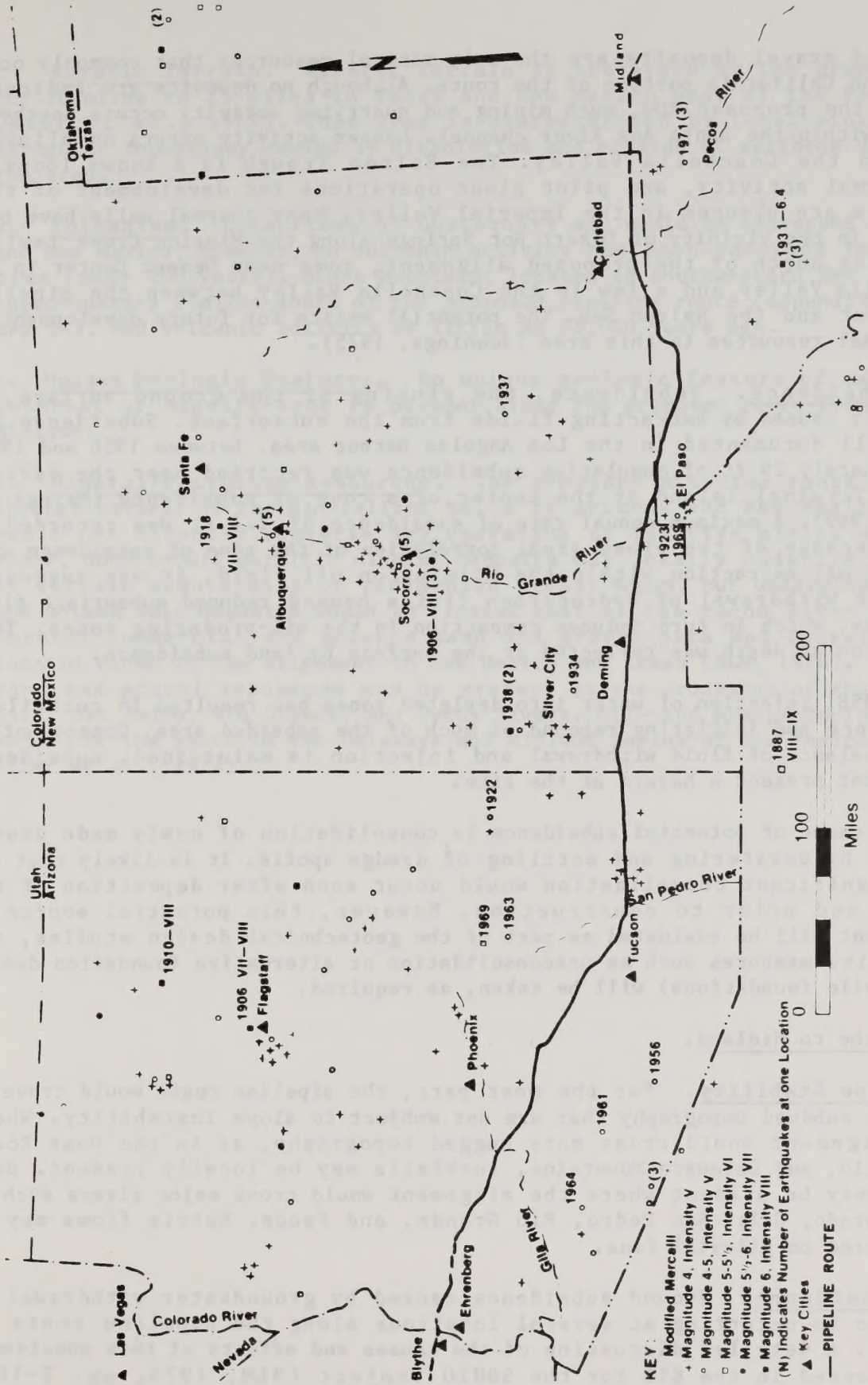


Figure 3.2.2-11 - Blythe to Midland: Historical Seismicity (BLM, 1976, derived from Holmes & Narver, 1976)

Sand and gravel deposits are the only mineral resources that commonly occur along the California portion of the route. Although no deposits are indicated within the proposed ROW, much mining and quarrying activity occurs nearby at Colton within the Santa Ana River channel. Lesser activity occurs on alluvial fans in the Coachella Valley. The Salton Trough is a known locus of geothermal activity, and pilot plant operations for development of this resource are planned in the Imperial Valley. Many thermal wells have been drilled in the vicinity of Desert Hot Springs along the Mission Creek fault a few miles north of the proposed alignment, some near Desert Center in the Chuckwalla Valley and a few in the Coachella Valley between the pipeline alignment and the Salton Sea. The potential exists for future development of geothermal resources in this area (Jennings, 1975).

d. Subsidence. Subsidence, the sinking of the ground surface, is typically caused by extracting fluids from the subsurface. Subsidence has been well documented in the Los Angeles Harbor area. Between 1928 and 1965, approximately 29 ft of cumulative subsidence was recorded near the eastern end of Terminal Island at the center of a cone of subsidence (Mayuga and Allen, 1969). A maximum annual rate of subsidence of 2.4 ft was recorded in 1951. Because of the close areal correlation of the zone of subsidence with areas of oil extraction within the Wilmington oil field, it was suggested that the withdrawal of hydrocarbon fluids caused reduced subsurface fluid pressures, which in turn induced compaction in the oil-producing zones. This compaction at depth was reflected at the surface by land subsidence.

Since 1958, injection of water into depleted zones has resulted in curtailing subsidence and initiating rebound of much of the subsided area. Consequently, if the balance of fluid withdrawal and injection is maintained, subsidence should not present a hazard at the site.

Another cause of potential subsidence is consolidation of newly made ground created by dewatering and settling of dredge spoils. It is likely that the most significant consolidation would occur soon after deposition of the spoils and prior to construction. However, this potential source of settlement will be evaluated as part of the geotechnical design studies, and mitigative measures such as preconsolidation or alternative foundation design (e.g., pile foundations) will be taken, as required.

2. Blythe to Midland.

a. Slope Stability. For the most part, the pipeline route would traverse areas of subdued topography that are not subject to slope instability. Where the alignment would cross more rugged topography, as in the Dome Rock, Peloncillo, and Delaware Mountains, rockfalls may be locally present. Bank caving may be present where the alignment would cross major rivers such as the Colorado, Gila, San Pedro, Rio Grande, and Pecos. Debris flows may be encountered on alluvial fans.

b. Subsidence. Ground subsidence caused by groundwater withdrawal is known to be occurring at several locations along the pipeline route in Arizona. A detailed discussion of the causes and effects of this subsidence is presented in the EIS for the SOHIO Project (BLM, 1976, pp. 2-102, 3-24, -25).

c. Karstic Terrain. Karstic terrain is traversed by the proposed route for 20 miles to 25 miles in Texas and New Mexico west of the Pecos River (Kier et al., 1977). This area is characterized by local sinkholes and irregular topography caused by dissolution and erosion of saltbeds underlying the area.

d. Volcanism. Lava flows of Quaternary age would be traversed in Arizona and New Mexico; however, no volcanic activity has been recorded in historic time (past 200 years). Black Mountain, located in southwestern New Mexico and approximately 2 miles south of the proposed pipeline route (Appendix J, route map 14), had volcanic activity as little as 25,000 years ago.

e. Unique Geologic Features. No unique geologic feature of exceptional interest or significance is present along the proposed route from Blythe to Midland.

f. Mineral/Petroleum Resources. The proposed pipeline route would pass through several of the mineralized belts of Arizona and New Mexico, but it would not directly traverse any operating or inactive mining operation. Minor, noneconomic metallic mineral deposits may locally underlie the route in certain mountainous or pedimented areas. Known, but undeveloped, sulfur and potash salt deposits would be crossed east of the Pecos River in Texas. Several commercial and private sand and gravel pits and quarries may be located close to the alignment in New Mexico and Texas (BLM, 1976). Potential sand and gravel resources may be present at the crossings of the Colorado, Gila, San Pedro, Rio Grande, and Pecos Rivers. Oil- and gas-producing regions underlie the route in the Delaware and Midland Basins of New Mexico and Texas (Kier et al., 1977).

3.2.3 SOILS

This subsection describes the characteristics of the soil units underlying the proposed pipeline route. Table 3.2.3-1 describes the soils located in southern California from POLA to Blythe. Table 3.2.3-2 presents data for the remaining two segments of the route (i.e., Blythe to Pine Springs, Texas, and Pine Springs to Midland). Major soil units are grouped by location (e.g., southwestern Arizona) to provide geographical orientation. The major soil units (i.e., series, orientation, and land types) with corresponding setting descriptions are listed for each location along the proposed pipeline route.

Soil parameters including slope, depth, texture, and drainage class are described for each major soil unit. These major factors influence rehabilitation and erosion control and, therefore, support the limiting factor listed for each major soil unit. The soils characteristics as deep as the 8-ft to 12-ft excavation that would be necessary for the pipeline installation are unknown since the U.S. Soil Conservation Service surveys are generally limited to a depth of 5 ft.

A. POLA to Blythe

The major soils associations along the proposed pipeline route from the Port to Blythe are shown in Table 3.2.3-1. The soils are generally alluvial in nature because the route largely parallels stream courses such as the Los Angeles, San Gabriel, and Santa Ana rivers and their tributaries. The soil texture varies from fine sand and clay loams to gravelly, cobbly sands depending on the proximity to the stream channels and the slope. The soils of the coastal zone in proximity to POLA are sands belonging to the Oceano series (SCS, 1969). As the route continues north along the Los Angeles River Channel, the soils are primarily of the Tujunga-Soboda association. This association of loamy fine sand to cobbly loamy sands along with the Hanford series comprises approximately 60% of the soils in this part of the basin. As the route continues east, it follows fairly flat valley floors with finer textured soils such as the Merrill-Chino association (Woodruff and Brock, 1980). The proposed pipeline route passes along the floor of San Timoteo Canyon and through San Gorgonio Pass where the soils are generally of coarser texture, e.g., San Emigdio-Metz and Gorgonio series. The latter is found in the vicinity of the San Gorgonio and Whitewater Rivers.

The route through the Coachella Valley is comprised primarily of deep loamy sands and gravelly sands of the Rositas-Carrizo association. This association generally continues through the Chuckwalla Valley to Palo Verde Mesa with somewhat coarser textured soils associated with recent sorting and movement by water and wind. Adjacent to the pipeline route are areas of badlands with steep slopes and rock outcroppings. Also found locally are fine sands and dune sands in this part of the Sonoran desert (Knecht, 1971, 1980).

The pipeline route would rise over Palo Verde Mesa where it drops to Palo Verde Valley. The soils of this area are strikingly different from other soils in the Sonoran desert, having formed from alluvium and terrace sediments of the Colorado River. This is an area of highly productive irrigated croplands dominated by the Imperial-Holtville-Meloland Association of Soils (Elam, 1974). These are mostly well-drained silty clays, clay loams,

Table 3.2.3-1 - POLA to Blythe: Major Soil Units

Location	Soil Series[a] Associations	Setting	Slope (%)	Texture	Drainage Class	Major Limiting Factors
Southern California						
POLA and near shore	Oceano	Alluvial fan - coastal area	2-5	Sand	Excessive	Susceptible to wind erosion
	Tujunga-Soboda	Floodplains	0-30	Loamy fine sand-cobbly loamy sand	Excessive	Moderate to high wind erodibility
	Merrill-Chino	Valley Floors	0-2	Silty loam	Poor	None
	Tujunga-Delhi	Valley Floors	0-2	Loamy sand to loamy fine sand	Excessive	Moderate to high wind erodibility
	San Emigdio-Metz	San Timoteo Wash-floodplain	0-15	Fine sandy loam to loamy sand	Well	Moderate wind and water erodibility
	Gorgonio	Floodplain	2-15	Gravelly, cobbly, loamy sand	Moderate-Excessive	None
	Rositas-Carrizo	Alluvial Plains	0-9	Gravelly coarse sand to sand	Excessive	None
Blythe-Palo Verde Valley	Imperial-Holtville Meloland	Alluvial Valley	0-2	Silty clay, loamy fine sand to clay loam	Mostly well	High corrosivity to steel

[a]All associations shown are very deep soils with at least 60 in. to rock.
Source: SCS, 1969; Woodruff and Brock, 1980; Knecht, 1980; BLM, 1976, Attachment 1, pp. 29-59.

Table 3.2.3-2 - Blythe to Midland: Major Soil Units

Location	Soil Series, Association, Land types	Setting	Slope (%)	Depth[a]	Texture	Drainage Class	Major Limiting Factors
Blythe to Pine Springs							
Southwestern Arizona	Gilman-Antho-Vint	Floodplains and alluvial fans	0-3	Deep	Loam, sandy loam, loamy fine sand	Well	Subject to flooding, some areas of agricultural land
	Gunsight-Rillito-Pinal	Alluvial surfaces and valley plains	0-15	Deep to shallow (hardpan)	Very gravelly loam, gravelly sandy loam, gravelly loam	Well	Slope, depth to rock
	Lomitos-Cherioni-Gachado	Hills and mountains with rock outcrops	2-70	Shallow	Very cobbly loam, very gravelly	Well	Slope, depth to rock
	Harqua-Perryville-Gunsight	Old fan surface	0-8	Deep	Gravelly clay loam, gravelly loam, very gravelly loam	Well	None
Southeastern Arizona	House Mountain-Lampshire-Mabray	Hills and mountains with rock outcrop inclusions	9-75	Shallow	Stony clay loam, very cobbly loam	Well	Slope, depth to rock
	Latene-Nickel-Pinaleno	Dissected alluvial fans	1-75	Deep	Loam, very gravelly sandy loam	Well	Slope
	Caralampi-White House	Dissected old alluvial fans	5-30	Deep	Very gravelly sandy loam, gravelly loam	Well	Slope
	Crot	Playas	0-1	Deep	Sandy loam	Poor	Sodic/saline, somewhat poorly drained

Table 3.2.3-2 (Contd)

Location	Soil Series, Association, Land types	Setting	Slope (%)	Depth[a]	Texture	Drainage Class	Major Limiting Factors
New Mexico	Mohave-Stellar	Lower parts of piedmont slopes or plains between desert mountains and broad basin floors	0-5	Deep	Sandy clay loam, loam, sandy loam, loamy sand	Well	None
	Hondale-Mimbres	Basin floors and valley bottoms	0-2	Deep	Loam, silt loam, silty clay loam	Well	Alkalinity
	Cacique-Pintura	Sandy plains dominated by sand dunes and hummocks	0-5	Moderately deep to deep	Sandy loam, loamy sand, fine sand	Well	Coarse-textured surface layer
	Gila-Vinton	Rio Grande River floodplain	0-2	Deep	Sand to clay (highly stratified)	Variable	Subject to flooding, irrigated cropland
Texas	Hueco-Wink-Wichett-Pyote	Valley fills, dune deposits bedrock areas, and residual soils from sedimentary rocks	0-3	Deep	Loamy fine sand	Well	Coarse-textured
	Congers-Ratliff-Upton Reakor	Valley fills, dune deposits, bedrock areas, and residual soils from sedimentary rocks	0-5	Deep	Gravelly loam, clay loam	Well	None
	Holloman-Reeves-Hoban	Salt Basin (west of Guadalupe Mountains)	0-50	Deep	Sandy silty clay loam, clay loam, silty clay loam	Well	Alkalinity
	Ector Rock Outcrop	Guadalupe Mountains	1-40	Shallow	Gravelly loam	Well	Slope, depth to rock

Table 3.2.3-2 (Contd)

Location	Soil Series, Association, Land types	Setting	Slope (%)	Depth[a]	Texture	Drainage Class	Major Limiting Factors
Pine Springs to Midland							
New Mexico	Upton-Reakor	Plain sloping to Pecos River	0-9	Very deep	Gravelly loam, clay loam	Well	Water erodibility
	Kermit-Maljamar	Sandy plains, active sand dunes	0-5	Deep	Fine sand, sandy clay	Well	Subject to wind erosion
Texas	Jalmar-Penwell	Sandy plains, active sand dunes	0-8	Very deep	Fine sand, sandy clay	Well	Subject to wind erosion
	Kimbrough-Stegal	High Plains	0-3	Moderately deep	Gravelly loam,	Well	Caliche, hardpan
	Aramarillo-Arvana-Midessa	Floodplains, alluvial surfaces	0-3	Moderately deep to deep	Sandy clay loam	Well	None

[a]very deep = >60 in.
deep = 40-60 in.
moderately deep = 20-40 in.
shallow = 10-20 in.

Source: BLM, 1984a, pp. 3-25, -26 (as summarized from BLM, 1976, Attachment 1, pp. 29-59; SCS, 1975; Maker et al., 1978); Chugg et al., 1971; Turner et al., 1974.

and loamy fine sand. They may be moderately to highly corrosive to steel as a result of locally high groundwater tables. The Palo Verde Valley is used intensely for irrigated cropland. Agricultural techniques include very deep (6-ft to 10-ft) tilling.

The soils of Los Angeles Harbor to be used as dredge fill for island development is variable, resulting from both natural processes and prior dredging. Most of the dredge material will be unconsolidated sediments from the outer harbor. The natural sediments are composed of sands, silts, and clays, in varying proportions, dominated by fine sands to silty sands (COE 2020, 1984a; Dames & Moore, 1975). Based on the geotechnical evaluation conducted by Woodward-Clyde (1975), most of the soils to be dredged are dense, silty sands. This report evaluated a similar area to the Pactex proposal and estimated 25% to 30% fines. Higher percentages of fines are found at depths greater than 65 ft and in an area to the southwest side of the turning basin. The subsurface soils are generally at relative densities of greater than 75%. There are clay deposits in addition to the silty sands, which tend to be stiff in consistency. The surface sediments often consist of a soupy and very soft muck but generally only a few inches thick (Woodward-Clyde, 1975). For more detailed discussion of surficial sediment physical and chemicial properties, see subsection 3.2.15.

B. Blythe to Pine Springs

The major sensitive soils that would be intersected by this pipeline segment are characterized by high salinity, steep slopes, coarse-textured surface layers, shallow depth to bedrock, and those subject to flooding (Table 3.2.3-2). Sensitive soils in Arizona are typically coarse-textured, shallow, and occupy steep slopes. Included are areas subject to flooding (floodplains) and areas of high salinity (playas). The sensitive soils along the New Mexico and Texas pipeline segment are alkaline (e.g., Salt Basin) and contain coarse-textured surface layers (e.g., Rio Grande). The Guadalupe Mountains have steep slopes and rock outcrops with potential for landslides and rockfalls (BLM, 1984a, p. 3-27).

C. Pine Springs to Midland

The pipeline route would continue northeast from Pine Springs into New Mexico. It would cross the Pecos River floodplain, an area subject to flooding approximately 6 miles north of Red Bluff Reservoir. The route would continue east to Midland through an area in New Mexico and Texas of sandy soils with active sand dunes prone to wind erosion. Other sensitive soils include those in the floodplain of the Midland River, an intermittant stream northwest of the Midland Terminal (Table 3.2.3-2).

3.2.4 SURFACE WATER

The pipeline route would be located in the generally arid southwest region of the United States that is characterized by predominantly ephemeral streams. These streams have no base flows and high peak flows resulting from precipitation. Several large perennial streams such as the Colorado River would also be crossed by the pipeline route. The major streams that would be crossed or located closely parallel to the proposed pipeline are shown in Tables 3.2.4-1 and 3.2.4-2. The pipeline would also cross numerous tributary drainages and other intermittent creeks. A summary of stream crossings and their status is shown in Table 3.2.4-3. The characteristics of the major rivers and streams are described below by pipeline segment.

A. POLA to Blythe

For a large portion of the proposed route between POLA and Blythe, the pipeline would either follow or cross surface water channels. The surface water resources are very significant to the Los Angeles Basin (and southern California in general) by providing water directly for municipal supplies and irrigation uses, as well as indirectly adding to the groundwater resources through natural channel and numerous artifical recharge basins. However, the combined natural surface water and groundwater resources are inadequate to meet the demands of the Los Angeles Basin. Water is thus supplemented by an extensive system of aqueducts such as the Colorado River aqueduct that brings water from the Colorado River near Parker Dam to the San Jacinto Reservoir and Lake Matthews, in Riverside County. The aqueduct exists as an underground pipe in the vicinity of the proposed pipeline route near Banning. Water is also imported from the Owens and Central Valley areas. Other natural stream channels may be highly modified, particularly in the lower reaches through urbanized areas, in order to function in flood control.

During the November-April period, about 87% of the annual precipitation falls as rain throughout most of the area affected by the project and as snow in the nearby mountains (Waananen and Bean, 1966). Occasional summer rainfall occurs principally from convection-type storms in the interior. Typical mean seasonal precipitation varies from 30 in. to 40 in. in the San Bernadino and San Jacinto Mountains to 3.6 in. in desert valleys such as Indio. Runoff is thus sporadic with many streams existing as surface flow only intermittenly throughout the year (CRWQCB, 1984c).

The streamflow characteristics of major stream crossings between POLA and Blythe are shown in Table 3.2.4-1. The three major river basins are the Los Angeles, San Gabriel, and Santa Ana. Several other creeks that are tributary to those shown would also be crossed by the pipeline. For example, San Jose Creek, a tributary of the San Gabriel River, would be crossed in the La Puente-Hacienda Heights area. Tributaries to the Santa Ana River include Chino Creek and Cucamonga Creek (near Chino), as well as Lytle and Warm Creeks, which join the Santa Ana near Colton. Table 3.2.4-1 also shows that stream flow ranges from very high discharge during flood events to no flow in most stream courses. Although the extremes shown are daily observed values, this pattern of peak flow in the winter months with low or no flow during the summer months is typical of the area. In the desert areas east of the mountain ranges, this pattern may be altered with peak runoff resulting from thundershowers in the summer months.

Table 3.2.4-1 - POLA to Blythe: Stream Flow Characteristics

River	Discharge (ft^3/sec) Maximum	Minimum	Average	Period of Record	Drainage Area at the Gauge (mi^2)
Los Angeles River at Long Beach	129,000 (Feb 16, 1980)	No flow at times	199	Dec. 1928-1982	827
Rio Hondo below Whittier Narrows Dam	38,800 (Jan 25, 1969)	No flow at times each year	NA[a]	Oct. 1966-1982	124
San Gabriel River above Whitter Narrows Dam	46,600 (Jan 25, 1969)	No flow at times of most years	NAa	Oct. 1955-Sept. 1957, Oct. 1963-1982	353
Cucamonga Creek near Mira Loma	9,100 (Jan 25, 1969)	No flow most of some years	2.74	Jan. 1968-Jul. 1977 Jan. 1979-1982	75.8
Santa Ana River at E Street near San Bernadino	28,000 (Feb 25, 1969)	No flow[b] for several days in some years	2.78	March 1939-Sept. 1954 Oct. 1966-1982	532
San Timoteo Creek near Loma Linda	15,000 (Feb 25, 1969)	No flow for several days in some years	2.78	Oct. 1954-Sept. 1965, Feb. 1968-Oct. 1973, April 1979-1982	125
Whitewater River at Indio	11,400 (Jan 25, 1969)	No flow all or most of each year	3.88	March 1966-1982	1,073

[a]Average discharge not shown for these stations.
[b]The Santa Ana River is perennial in the vicinity of the proposed pipeline crossing because of significant flows of secondary effluent from the San Bernardino municipal sewage treatment plant.
Source: Bowers et al., 1984.

Table 3.2.4-2 - Blythe to Pine Springs:
Major River Flow Characteristics

River	Discharge (ft^3/sec)			Period of Record	Drainage Area at the Gauge(mi^2)
	Maximum	Minimum	Average		
Colorado River near Blythe, CA	39,000 (Aug 17, 1983)	1,060 (Nov 25, 1972)	7,586	Apr 1969-Sep 1980	186,200
Gila River above diversions at Gillespie Dam, AZ	124,000 (Feb 17, 1980)	No flow at times[a]	338	Jun 1935-Sep 1981	49,640
San Pedro River near Redington, AZ	28,600 (Aug 2, 1951)	No flow at times in most years	46.1	Jun 1947-Sep 1980	2,939
Rio Grande at El Paso, TX	13,500[b] (Sep 3, 1925)	No flow at times	501	1938-Sep 1981	32,207

[a]Most recently July 14, 1967.
[b]This is largest discharge since construction of the Elephant Butte Dam.
Source: USGS, 1980a,b; BLM, 1984a, p. 3-32.

Table 3.2.4-3 - POLA to Midland: Stream Crossings

State	Stream Crossed	County	Status[a]
POLA to Blythe[b]			
California	Los Angeles River	Los Angeles	I
	Rio Hondo (Percolation Basin)	Los Angeles	I
	San Gabriel River	Los Angeles	I
	Metropolitan Aqueduct	San Bernardino	NA
	Santa Ana River	San Bernardino	P
	San Timoteo Creek	San Bernardino	I
	San Gorgonio River	Riverside	I
	Colorado River Aqueduct	Riverside	NA
	Whitewater River	Riverside	P
Blythe to Midland[b]			
Arizona	Colorado River	La Paz	P
	Centennial Wash	Maricopa	I
	Gila River	Maricopa	P
	Gila Bend Canal	Maricopa	P
	North Branch Santa Cruz Wash	Pinal	I
	Florence-Casa Grande Canal	Pinal	I
	San Pedro River	Pima	I
	San Simon Creek	Cochise	I
	Bass Canyon Creek	Cochise	P
	Wildcat Creek	Cochise	P
New Mexico	Rio Grande (several draws and drains in Rio Grande area)	Dona Ana	P
	West Drain	Dona Ana	I
	La Union Canal	Dona Ana	I
	Anthony Drain	Dona Ana	I
Texas	Eightmile Draw (dry)	Hudspeth	I
	Guadalupe Arroyo (dry)	Hudspeth	I
	Salt Basin Area	Hudspeth	I
	Delaware River	Culbertson	I
New Mexico	Owl Draw	Eddy	I
	Pecos River	Eddy	P
Texas	Midland Wash	Midland	I

[a]I = intermittent, P = perennial, NA = not applicable.
[b]Numerous other creeks and minor drainages along the route.
Source: BLM, 1984a, p. 3-29; ES, 1985.

The pipeline route would parallel the Los Angeles River north from POLA and would cross this channel in Carson as an aboveground structure. The route would continue north along the east side of the Rio Hondo River until the Whittier Narrows Dam, where it would head east. The pipeline would then cross the San Gabriel River and continue east along the south side of San Jose Creek. For most of the remainder of the river and stream crossings in southern California, the pipeline would be buried. Several tributaries to the Santa Ana River would be crossed prior to crossing the main part of the wash near Colton. Through San Timoteo Canyon, the pipeline would closely parallel the stream channel.

The streams located to the east of the San Bernardino Mountains are part of the internal Salton Sea drainage. These include the San Gorgonio and Whitewater Rivers, which flow into the Coachella Valley. Other minor tributaries of the Colorado River are also crossed by the pipeline route.

Within California, surface waters are classified by beneficial uses, both existing and potential future uses. The State Water Resources Control Board has defined 21 standard beneficial use classifications (CRWQCB, 1975, 1984a, 1984c). Each stream may receive as many designated uses as appropriate. These beneficial uses, then, are used to define the water quality objectives. Each of these beneficial uses occurs within the region of the proposed project from the marine environment at POLA to the Colorado River. However, the uses of the streams crossed by the pipeline route are primarily for municipal and domestic supply, agricultural supply, industrial service supply, industrial process supply, and groundwater recharge. Other uses are limited but may occur in other reaches of the stream (e.g., cold and warm water habitat in the upstream reaches and tributaries of the Santa Ana River).

Water quality in surface streams is highly variable. In the urban stream sections such as the lower reaches of the Los Angeles and Santa Ana Rivers, the water quality is degraded by urban runoff and treated municipal waste discharges further upstream resulting in high dissolved solids and generally poor quality, particularly in the dry summer months. The runoff following winter storms produces successively improved water quality although suspended sediments may be very high during peak discharge events. Streams such as San Timoteo Creek are less effected by pollutants but still have high dissolved solids concentration during low flow. The water quality of the San Gabriel River is characterized by high sulfates, dissolved solids, and hardness with relatively high dissolved oxygen concentrations. The Santa Ana River water has similar characteristics with low turbidity. For more detailed information on water quality of these streams, see the discussion in the SOHIO EIS (BLM, 1976).

B. Blythe to Pine Springs

Four major river drainages occur between Blythe and Pine Springs: the Colorado, Gila, San Pedro, and Rio Grande. The discharge characteristics are shown in Table 3.2.4-2. Water quality is variable with high suspended sediments corresponding to the time of peak flows. The Colorado, Rio Grande, and Gila Rivers are regulated, perennial rivers. This regulation by dams and

diversions tends to moderate the magnitude of large flow events. The pipeline would cross the Colorado River just south of Blythe below the Palo Verde Dam, a diversion structure supplying irrigation water to the Palo Verde Valley. The San Pedro River is intermittent in the locale of the proposed pipeline crossing, but it is perennial upstream. The Rio Grande aproaches no-flow conditions most years partly because of seasonal variation in runoff but also because of large upstream withdrawals for irrigation. Other surface water that would be intersected by the pipeline route include the Santa Cruz River, Centennial Wash, the Florence-Casa Grande Canal, San Simon Creek, and the Salt Basin playa. Other small but important streams include Bass Canyon and Wildcat Creeks in eastern Arizona.

In Arizona, surface water quality is regulated by the Arizona Department of Health Services. Streams are classified by protected uses similar to those described for California. Each protected-use classification has specific water quality standards associated with it. The protected uses are:

(1) Domestic water source
(2) Full body contact recreation
(3) Partial body contact recreation
(4) Agricultural irrigation
(5) Agricultural livestock watering
(6) Aquatic and wildlife

Aquatic and wildlife-protected streams may also be designated as coldwater or warmwater fisheries. New Mexico surface waters are protected by the Water Quality Control Commission. This agency uses designated use classifications similar to the protected uses descrived for Arizona.

C. Pine Springs to Midland

The only major river that would be crossed by the pipeline route east of Pine Springs is the Pecos River. The pipeline would cross the Pecos River just north of the Red Bluff Reservoir, south of Loving, New Mexico. The Pecos River has a peak discharge of 23,700 ft^3/sec near Orla, Texas and has an average discharge of 169 ft^3/sec for the 21,210-mi^2 drainage area. The Pecos River is one of the major tributaries to the Rio Grande. The water quality is saline with dissolved solids ranging from 456 ppm to 22,800 ppm. The suspended solids concentration is generally higher than 5,000 ppm. Other minor drainages flow into the Pecos and would be crossed by the pipeline east of the river. The pipeline would also cross the intermittent Midland River, which provides recharge to the alluvial aquifers near Midland.

3.2.5 GROUNDWATER

A significant amount of water used in the southwest regions of the United States is subsurface or groundwater. In California, groundwater supplies a significant amount (approximately 40%) of the water supply needs (California Department of Water Resources, 1975). In rural areas, groundwater may provide as much as 95% of the supply. In the Los Angeles Metropolitan area, water is supplied to user agencies by the Metropolitan Water District (MWD). Approximately 45% of the supply is local, mostly in the form of groundwater. The remaining 55% is imported from three sources:

(1) Colorado River Aqueduct (Colorado River)
(2) Los Angeles Aqueduct (Owens Valley)
(3) State Water Project (Central Valley)

Approximately 20% of the imported water goes to groundwater recharge (Young,1985). The following description of the groundwater resources along the proposed pipeline route is presented with this in mind. The pipeline would intersect approximately 25 major groundwater basins along the 1,031-mile route. Of these basins, 15 are considered to be sensitive to potential effect of the pipeline. Sensitive groundwater basins are defined to be those with a water table within 100 ft of the surface or those with a moderate-to-high degree of high quality water development.

A. POLA to Blythe

An integral part of the water supply in southern California is groundwater. Water occurs in natural aquifers, many of which have been modified by artificial recharge from percolation basins. Groundwater is thus used as a natural storage medium to help equalize the seasonal and longer term climatic variation in surface water supplies. Recharge occurs from the downward percolation of rainwater and snowmelt from surrounding mountains into the coastal plains sediment. Groundwater is found in both shallow water tables and deeper confined aquifers. Areas along the route in southern California are underlain by fairly deep alluvium of river valleys, generally good sources of water. Table 3.2.5-1 and Figure 3.2.5-1 show the groundwater basins that would be crossed by the pipeline from the POLA to Blythe.

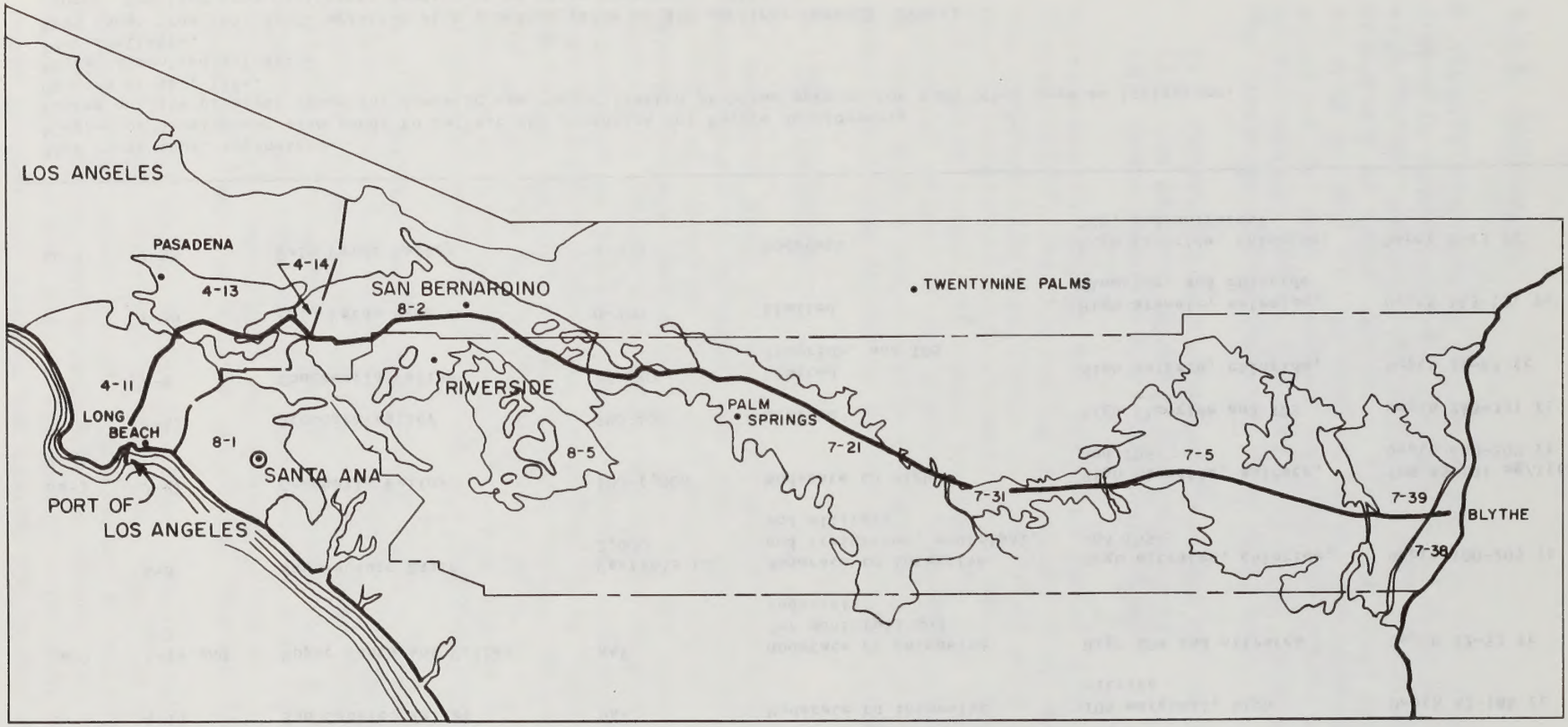
As with surface water, groundwater quality in California is regulated by the State Water Resources Control Board and administered by regional boards in each major watershed or basin. The same beneficial use designations as described for surface water (subsection 3.2.4) are used for groundwater; however, the range of uses would be much more limited in scope. Groundwater uses include municipal and domestic supply, agricultural, and industrial supplies. They may also be occasional sources for freshwater replenishment.

The coastal plain of Los Angeles consists mainly of unconsolidated sediments or alluvium underlain by bedrock. Aquifers occur as shallow unconfined, semiperched water in the upper parts of alluvial deposits in the Downey and Torrance plains, and principally in recent and Pleistocene deposits in the remainder of the basin. Saltwater intrusion is a problem in coastal areas where groundwater pumping has caused freshwater tables to fall significantly,

Table 3.2.5-1 - Southern California: Groundwater Basins

Map[a] Code	Basin No.	Groundwater Basin	Depth Zone (ft)	Degree of Groundwater Development[b]	Local Problems[c]	Representative Wells[d]
GW-1	4-11	Los Angeles Coastal Plain	Variable to 2,000	Intensive for municipal	Chloride, sulfate, TDS[e], seawater intrusion	Depth 53-132 ft
	4-13	San Gabriel Valley	NA[f]	Moderate to intensive	TDS marginal, high nitrate	Depth 62-184 ft
GW-2	4-14 and 8-2	Upper Santa Ana Valley	NA[f]	Moderate to intensive for municipal and industrial	High TDS and nitrates	Depth 22-52 ft
	8-5	San Jacinto Basin	Variable to 2,000	Moderate to intensive and irrigation, municipal, and military	High nitrates, chloride, and TDS	Depth 100-209 ft
GW-3	7-21	Coachella Valley	100-1,000	Moderate to high	High fluoride, sulfate, and TDS	TDS 95-131 mg/liter Depth 400-500 ft
	7-31	Orocopia Valley	200-400	Limited	High fluoride and TDS	Depth 243-331 ft
	7-5	Chuckwalla Valley	20-220	Limited fluoride, and TDS	High sulfate, chloride,	Depth 21-87 ft
	7-39	Palo Verde Mesa	0-300	Limited	High arsenic, selenium, fluoride, and chloride	Depth 143-171 ft
GW-4	7-38	Palo Verde Valley	0-300	Moderate	High fluoride, chloride, TDS, and sulfates[g]	Depth 9-13 ft

[a]See route maps, Appendix J.
[b]Degree of development also tends to reflect the potential for future development.
[c]Water quality problems shown for domestic use; other limited problems present for such other uses as irrigation.
[d]Bowers et al., 1984.
[e]Total dissolved solids.
[f]Not available.
[g]TDS range from 485-13,100 mg/liter with a median value of 930 mg/liter (CRWQCB, 1984a).
Source: Modified from California Department of Water Resources, 1975.



MAP CODE	BASIN NAME
4-11	COASTAL PLAIN OF LOS ANGELES
4-13	SAN GABRIEL VALLEY
4-14,8-2	UPPER SANTA ANA VALLEY
8-1	COASTAL PLAIN-ORANGE COUNTY
8-5	SAN JACINTO BASIN
7-21	COACHELLA VALLEY
7-31	OROCOPIA VALLEY
7-5	CHUCKWALLA VALLEY
7-39	PALO VERDE MESA
7-38	PALO VERDE VALLEY

Figure 3.2.5-1 - Southern California: Major Groundwater Basins
(California Department of Water Resources, 1975)

allowing invasion from saturated shoreline sediments. Total dissolved solids are generally less than 1,000 ppm but may reach 36,000 ppm locally.

In the POLA area, there are several significant aquifers, some of which provide the water supply of local cities including the city of Long Beach. These aquifers are associated primarily with ancient buried stream channels and floodplain deposits of the Los Angeles and San Gabriel Rivers.

The uppermost aquifer in the harbor is the Gaspur zone. This zone varies from fine-grained clay and silt to medium to coarse textured sand and coarse, clean gravel in its lower part. It ranges in thickness from 50 ft to 100 ft. The base of the zone slopes from about 100 ft below land surface (90 ft above sea level) at Whittier Narrows to 150 ft below sea level at the coast.

The Gaspur zone overlies the Gage aquifer, also termed the 200-ft sand aquifer. It is a sequence of fine- to medium-grained sand with variable amounts of gravel, sandy silt, and clay. Thickness ranges from 75 ft to 200 ft (Randall et al., 1983). Past harbor dredging has exposed the Gaspur and 200-ft sand aquifers to direct seawater contact in areas.

The Gage aquifer is locally contiguous with the Lynwood or 400-ft gravel aquifer. This zone is a homogeneous mixture of gravel, coarse sand, silt, and clay and ranges in thickness from 50 ft to 200 ft. Its base varies from 225 ft to 425 ft below sea level in the area of Long Beach.

The Gage, Lynwood, and underlying Silverado and Sunnyside aquifers provide significant sources of water for coastal cities near POLA. Approximately 30,000 acre-feet/year are withdrawn by the city of Long Beach. Because of the intensive development along the coast, however, saltwater intrusion is a significant problem. A barrier injection project is under way to control this problem.

The pipeline route would enter the San Gabriel Valley near Whittier Narrows and cross the southern part of the valley paralleling San Jose creek. The pipeline route would then traverse the southern part of the Upper Santa Ana Valley eastward to the drainage divide between the Santa Ana and Coachella Valleys. Groundwater occurs here in alluvium and older sediments. The presence of faults through this area acts as relatively impermeable barriers to groundwater movement. The groundwater quality in the upper part of the basin is generally good with locally high total dissolved solids (TDS) and nitrates for domestic use.

The Coachella Valley groundwater basin is used heavily for irrigation. The approximately 60,000 acres of irrigated land is also supplemented with Colorado River water via the Coachella canal with typical TDS of 800-1,000 ppm (Springer, 1985). Groundwater is stored principally in the unconsolidated Pleistocene sediments with wells yielding up to 4,000 gpm. Maximum thickness of the aquifers is not known; however, it exceeds 1,000 ft. The groundwater is generally unconfined except in the lower areas of the valley where a clay aquifer underlies lenses of permeable sediments and perched groundwater. Groundwater flow is altered extensively by faults including the Mission Creek, Banning, and San Andreas. These effective barriers have resulted in oases such as the Thousand Palms Oasis on the main trace of the San Andreas

fault (CRWQCB, 1984a). The Coachella Valley is also an active geothermal area with observed temperatures in the 60°F to 90°F range; a peak temperature in excess of 200°F has been recorded.

The pipeline route would cross the Orocopia and Chuckwalla groundwater basins before crossing Palo Verde Mesa and Palo Verde Valley basins. Orocopia is a fairly small basin with groundwater occurring in alluvium derived from the adjacent mountains. The Chuckwalla Valley is larger with an irregular shape and internal drainage. The pipeline route would pass south of Hayfield Lake. Surface drainage goes to either of two dry lakes, Palen or Ford, with groundwater movement flowing eastward to the Colorado River Valley. The Palo Verde Valley basin is located within the floodplain of the Colorado River. The depth to the water table is thus fairly shallow, mostly less than 10 ft. The depth to water increases to about 150 ft at the divide between the Colorado River Valley and the Chuckwalla Valley. The Palo Verde basin is moderately well developed for irrigation uses, resulting in locally high TDS, fluoride and sulfate concentrations.

B. Blythe to Pine Springs

Groundwater occurs in desert basins and alluvial valleys of major streams along the Blythe to Pine Springs pipeline segment. Information pertaining to 15 groundwater basins (BLM, 1984a, p. 3-36) is summarized in Table 3.2.5-2. Based on the criteria of depth to groundwater and the degree of aquifier use, nine basins are shown to be sensitive to potential effects of the proposed pipeline. Conditions along much of the remainder of this segment would include limited groundwater availability, great depth to water, or poor water quality that frequently limits the potential for significant groundwater development and use.

C. Pine Springs to Midland

The two major groundwater basins in this segment of the proposed route are the Pecos River Basin and the Texas Basin. A significant proportion of this area is underlain by the Ogallala formation of Tertiary age, which provides the public water supply for many cities, including Midland. Other sources from the Dockum group of Triassic age and the Quaternary alluvial deposits (U.S. Geologic Survey, 1953) supply cities such as Pecos. Also present toward the western extent of the Texas Basin is the Edwards-Trinity aquifer of Cretaceous age. Both the Pecos River Basin and this portion of the Texas Basin are considered to be sensitive based on the criteria discussed above.

The Ogallala formation has experienced extensive overdraft in recent years because of the moderate to intensive development and limited recharge. In the future, the Ogallala will become less economical, particularly where it is most heavily developed.

Table 3.2.5-2 - Blythe to Midland: Groundwater Basins

Map[a] Code	Groundwater Basin	Length of Pipeline through Basin (miles)[b]	Minimum Depth to Water Table (ft)	Degree of Groundwater Development	Total Dissolved Solids (ppm)
Blythe to Pine Springs[c]					
GW-5	La Posa	12[d]	<100	moderate	NA
	Ranegras Plain	12	>300	low	800
	Harquahala Plains	14	>200	high	500-800
GW-6	Centennial Area	16[d]	62-227	moderate	1,000-3,000
	Gila Bend	11	>200	moderate	1,200-1,530
	Waterman Wash	27	>200	moderate	302-876
GW-7	Lower Santa Cruz	71[d]	44-453	high	373-964
GW-8	San Pedro River	26[d]	45-215	moderate	243-344
GW-9	Sulphur Springs Valley	12[d]	26-339	moderate	440-782
GW-10	San Simon	32[d]	48-395	high	260-289
GW-11	Animas/Lordsburg Valleys	19[d]	57-275	moderate	279-590
GW-12	Mimbres Valley	15[d]	60-100	moderate	194-992
GW-13	Rio Grande Valley	14[d]	<10-480	high	NA
	Hueco Bolson	6	268-381	moderate	500
	Salt Basin	72	<100	moderate	NA
Pine Springs to Midland[e]					
GW-14	Pecos River Valley	180[d]	60-85	moderate	800-3,000
GW-15	Texas Basin (Midland Area)	64[d]	37-97	moderate	322-2,278

[a]See maps, Appendix J.
[b]Lengths of sensitive areas are probably overestimates because entire basin widths are used where detailed information is not available.
[c]BLM, 1976, pp. A-268, -269; BLM, 1984a, pp. 3-34, -35.
[d]Indicates sensitive areas.
[e]BLM, 1976, p. A-268, 269.

3.2.6 FRESHWATER BIOLOGY

There are 23 major water systems crossed by the proposed pipeline between POLA and Midland, Texas. A list of these major water systems is presented in Table 3.2.6-1, and their environmental setting is described below. Common and scientific names of fishes described in the text are according to the American Fisheries Society (AFS, 1980).

A. POLA to Blythe

1. California Rivers. The low diversity of fish species in southern California rivers is the result of a lack of suitable habitat (primarily a lack of permanent water), highly variable rates of discharge, elevated turbidities, temperature fluctuations, dredging, and channelization (Table 3.2.6-2). The California Department of Fish and Game stocks channel catfish (Ictalurus punctatus), bass (Micropterus spp.), and trout (Salmo spp.) in Legg Lake at the Whittier Narrows Recreation Area. The following warm water fishes have been introduced into the nearby New Lakes wetlands: largemouth bass (Micropterus salmoides), black bullhead (Ictalurus melas), brown bullhead (Ictalurus nebulosus), green sunfish (Lepomis cyanellus), redear sunfish (Lepomis microlophus), bluegill (Lepomis macrochirus), mosquitofish (Gambusia affinis), threadfin shad (Dorosoma petenense), and fathead minnow (Pimephales promelas) (Bontrager, 1984).)

Fishes potentially occurring in the Santa Ana River include the Santa Ana sucker, (Catostomus santaanae), arroyo chub (Gila orcutti), speckled dace (Rhinichthys osculus), green sunfish, bluegill, largemouth bass, channel catfish, brown bullhead, common carp (Cyprinus carpio), and mosquitofish (Hoover, 1985). Periodic scouring by torrential rains prevents the Whitewater River from supporting substantial fish populations near the proposed pipeline crossing (Shearer, 1985).

2. Colorado River. Prior to modification by man, most fish habitat in the southwest consisted of flowing streams. The Colorado River provided extensive fish habitat prior to damming. This once-swift, turbid and turbulent river was subject to low flow during long drought periods. Damming resulted in stabilization of seasonally fluctuating temperatures, turbidities, and chemical conditions (Minckley, 1973). Storage reservoirs now regulate flows and eliminate seasonal flooding necessary for the maintenance of marsh habitats on the river delta and floodplain. Diversions for irrigation projects have decreased flow in the lower river. Except for portions of Imperial Reservoir, the river is channelized over much of its course. Phreatophytes are removed systematically from streambanks for water conservation. Ecosystems have developed within the highly managed channel of the river that are essential as refuges. These refuges provide habitat for many bird species, including several protected and endangered species. They also provide wintering ground for waterfowl and are the basis of a productive sport fishery. Dredged backwaters have been constructed to lessen the effects of river channelization. Flooding and subsequent sedimentation of diversion reservoirs have produced marsh habitats and shallow, productive lakes. These areas include backwater lakes between Ehrenberg Bridge and Cibola National

Table 3.2.6-1 - Important Perennial and Intermittent Streams Crossed by Proposed Pactex Pipeline

State	Stream	Status
California	Los Angeles River	Intermittent
	San Gabriel River	Intermittent
	Rio Hondo	Intermittent
	San Jose Creek	Intermittent
	Santa Ana River	Perennial
	Whitewater River	Perennial
	Colorado River	Perennial
Arizona	Gila River	Perennial
	Gila Bend Canal	Perennial
	North Branch Santa Cruz Wash	Intermittent
	Florence-Casa Grande Canal	Intermittent
	San Pedro River	Intermittent
	San Simon Creek	Intermittent
	Bass Canyon Creek	Perennial
	Wildcat Creek	Perennial
New Mexico	Rio Grande (several draws and drains in Rio Grande area)	Perennial
	West Drain	Intermittent
	La Union Canal	Intermittent
	Anthony Drain	Intermittent
	Pecos River	Perennial
Texas	Eightmile Draw	Intermittent
	Guadalupe Arroyo	Intermittent
	Salt Basin Area	Intermittent

Source: ES, 1985.

Table 3.2.6-2 - Fish Species Occurring in Southern California Rivers[a] Crossed by or near the Proposed Pipeline

Common Name	Scientific Name	Los Angeles River[b]	Rio Hondo[c]	Santa Ana River[d]
Mosquitofish[e]	Gambusia affinis	I[f]	I	I
Fathead minnow[e]	Pimephales promelas	-	I	I
Black bullhead[e]	Ictalurus melas	-	I	-
Goldfish	Carassius auratus	I	-	-
Arroyo chub[e]	Gila orcutti	-	-	N
Santa Ana sucker[f]	Catostomus santaanae	-	-	P
Largemouth bass[f]	Micropterus salmoides	-	-	P
Speckled dace[f]	Rhinichthys osculus	-	-	P
Green sunfish[f]	Lepomis cyanellus	-	-	P
Bluegill[f]	Lepomis macrochirus	-	-	P
Channel catfish[f]	Ictalurus punctatus	-	-	P
Brown bullhead[f]	Ictalurus nebulosus	-	-	P
Common carp[f]	Cyprinus carpio	-	-	P

Note: I = introduced, N = native, P = potentially occurring.
[a]No information is available for the reach of the San Gabriel River potentially affected.
[b]Downstream from the confluence of the Rio Hondo.
[c]Near Whittier Narrows Recreation Area.
[d]North of Prado Dam.
[e]Wells and Diana (1975).
[f]Hoover (1985).

Wildlife Refuge and in the Imperial Reservoir, including the Imperi National Wildlife Refuge (Williams Brothers, 1976, p. 2A.7-62).

Game fish species harvested from the lower Colorado River include largemouth bass, crappie (Pomoxis spp.), channel catfish, sunfish (Lepomis spp.), flathead catfish (Pylodictis olivaris), and common carp (Cyprinus carpio). Table 3.2.6-3 lists the fish species potentially occurring in the Colorado River near the proposed pipeline crossing.

Approximately five backwater lakes lie between the bridge at Ehrenberg, Arizona, and the beginning of the Cibola National Wildlife Refuge. These are dredged channels behind the levees that connect to the main river by culverts. Flow through the culverts and seepage of river waters through the sandy substrate maintain the level of the lakes. Backwater lakes are used extensively for fishing and camping.

3. Cibola National Wildlife Refuge. Downstream from the proposed pipeline crossing site is the Cibola National Wildlife Refuge that contains approximately 28 mi^2 of marsh, riparian woodland, and desert. The river has been channelized and shortened throughout the refuge. Cibola Lake is a meandering, dredged river channel 4.3 miles in total length. The backwaters and riparian areas serve as temporary winter habitats for heavy concentrations of waterfowl, as well as habitats for resident bird, mammal, and fish populations.

4. Imperial National Wildlife Refuge. Further downstream is the Imperial National Wildlife Refuge. Filled by sedimentation since its construction in 1938, the reservoir has a low storage capacity. Sedimentation has also isolated coves from the main channel creating at least 100 small lakes. Sedimentation has contributed to the formation of extensive marshes of cattails, bulrushes, and reeds. Imperial National Wildlife Refuge is the most extensive marsh area in the lower Colorado River below the proposed pipeline crossing. Its importance relates to its use as a refuge for wintering waterfowl and as an ideal habitat for protected species of shore birds. Recreational use in the area includes boating, hunting, and fishing (Williams Brothers, 1976, p. 2A.7-63).

B. Blythe to Pine Springs

1. Arizona. Most large rivers in Arizona have experienced modifications and associated effects similar to the lower Colorado River. Artificial canals and ditches ranging from small laterals to major waterways now represent major aquatic hibitat. Operational problems adversely affecting fishes include periodic drying for repair or cleaning, application of herbicides to control aquatic vegetation, and dredging operations (Minckley, 1973).

The first major perennial stream crossed by the proposed pipeline is the Gila River. Three game fish species and at least a dozen nongame species occur or potentially occur in the river (Table 3.2.6-4). The Gila Bend Canal potentially contains the same fish species that occur in the Gila River.

Table 3.2.6-3 - Fishes of the Lower Colorado River
(by division)

Common Name	Scientific Name	Division[a] PV	CI	IM
Native				
Bonytail	Gila elegans	X	X	X
Colorado chub	Gila robusta	-	-	X
Colorado squawfish	Ptychocheilus lucius	X	X	X
Razorback sucker (humpback sucker)	Xyrauchen texanus	X	X	X
Flannelmouth sucker	Catostomus latipinnis	-	-	X
Introduced				
Threadfin shad	Dorosoma petenense	X	X	X
Common carp	Cyprinus carpio	X	X	X
Golden shiner	Notemigonus crysoleucas	-	X	-
Red shiner	Notropis lutrensis	X	X	X
Fathead minnow	Pimephales promelas	-	-	X
Flathead catfish	Pylodictis olivaris	X	-	X
Channel catfish	Ictalurus punctatus	X	X	X
Black bullhead	Ictalurus melas	-	-	X
Yellow bullhead	Ictalurus natalis	-	X	X
Mosquitofish	Gambusia affinis	X	X	X
Sailfin molly	Poecilia latipinna	X	-	X
Striped bass	Morone saxatilis	X	-	X
Smallmouth bass	Micropterus dolomieui	X	X	-
Largemouth bass	Micropterus salmoides	X	X	X
Warmouth	Lepomis gulosus	-	-	X
Green sunfish	Lepomis cyanellus	X	X	X
Bluegill	Lepomis macrochirus	X	X	X
Redear sunfish	Lepomis microlophus	X	X	X
Black crappie	Pomoxis nigromaculatus	X	X	X
Zill's tilapia	Tilapia zilli	X	-	-

[a]Operational divisions of the lower Colorado River as referred to by the Bureau of Reclamation:
PV = Palo Verde (Blythe area)
CI = Cibola (Cibola NWR area)
IM = Imperial (Imperial NWR area)
Source: Minckley, 1979.

Table 3.2.6-4 - Blythe to Midland: Fish Species Occurring or Potentially Occurring in Perennial or Large Intermittent Streams

Common Name	Scientific Name	Arizona					New Mexico	
		Bass Canyon Creek[a]	Hot Springs Canyon Creek[a]	Wildcat Canyon Creek[a]	Gila River	San Pedro River	Rio Grande	Pecos River
Big scale logperch	Percina macrolepida	-	-	-	-	-	-	X
Black buffalo	Ictiobus niger	-	-	-	-	-	-	X
Black bullhead	Ictalurus melas	-	-	-	-	-	X	X
Black crappie	Pomoxis nigromaculatus	-	-	-	-	-	X	X
Bluegill	Lepomis macrochirus	-	-	-	-	-	X	X
Bullhead minnow	Pimephales vigilax	-	-	-	-	-	X	-
Channel catfish	Ictalurus punctatus	-	-	-	X	-	X	X
Common carp	Cyprinus carpio	-	-	-	X	-	X	X
Desert sucker	Catostomus clarki	X	X	-	X	X	-	-
Eastern silvery minnow	Hybognathus regius	-	-	-	-	-	-	X
Fathead minnow	Pimephales promelas	-	-	-	X	-	X	X
Flathead catfish	Pylodictis olivaris	-	-	-	-	-	X	X
Gila chub	Gila intermedia	X	X	-	-	-	-	-
Gila topminnow	Poeciliopsis occidentalis	-	-	-	-	-	-	-
Gizzard shad	Dorosoma cepedianum	-	-	-	-	-	X	X
Green sunfish	Lepomis cyanellus	-	-	-	X	-	X	X
Greenthroat darter	Etheostoma lepidum	-	-	-	-	-	-	X
Largemouth bass	Micropterus salmoides	-	-	-	X	-	X	X
Loach minnow	Tiaroga cobitis	-	-	-	X	-	-	-
Longear sunfish	Lepomis megalotis	-	-	-	-	-	X	X
Longfin dace	Agosia chrysogaster	X	X	X	X	X	-	-
Longnose gar	Lepisosteus osseus	-	-	-	-	-	-	X
Mexican tetra	Astyanax mexicanus	-	-	-	-	-	X	X
Mississippi silvery minnow	Hybognathus nuchalis	-	-	-	-	-	X	X
Mosquitofish	Gambusia affinis	-	-	-	X	-	X	X
Mozambique mouthbrooder	Tilapia mossambica	-	-	-	X	-	-	-
Pecos gambusia	Gambusia nobilis	-	-	-	-	-	-	X
Pecos pupfish	Cyprinodon pecosensis	-	-	-	-	-	-	X
Rainbow trout	Salmo gairdneri	-	-	-	-	-	X	X
Rainwater killifish	Lucania parva	-	-	-	-	-	-	X
Red shiner	Notropis lutrensis	-	-	-	X	-	X	X
Rio Grande killifish	Fundulus zebrinus	-	-	-	-	-	-	X
Rio Grande shiner	Notropis jemezanus	-	-	-	-	-	-	X
River carpsucker	Carpiodes carpio	-	-	-	-	-	X	X
Sailfin molly	Poecilia latipinna	-	-	-	X	-	-	-
Smallmouth buffalo	Ictiobus bubalus	-	-	-	-	-	X	X
Sonora sucker	Catostomus insignis	X	X	-	X	X	-	-
Speckled chub	Hybopsis gestivalis	-	-	-	-	-	-	X
Speckled dace	Rhinichthys osculus	X	X	-	-	-	-	-
Spikedace	Meda fulgida	-	-	-	X	-	-	-
Threadfin shad	Dorosoma petenense	-	-	-	X	-	X	-
Tidewater silverside	Menidia peninsulae	-	-	-	-	-	-	X
White bass	Morone chrysops	-	-	-	-	-	X	X
White crappie	Pomoxis annularis	-	-	-	-	-	X	X
Yellow perch	Perca flavescens	-	-	-	-	-	X	X

[a]Located in Muleshoe Ranch Preserve.

Sources: Koster, 1957; Minckley, 1973; BLM, 1984a, p. 3-43; Brooks, 1985; Hatch, 1985; Weaver, 1985.

Two perennial streams (Bass Canyon and Wildcat Canyon Creeks) would be crossed by the pipeline in Muleshoe Ranch Preserve; another perennial stream (Hot Springs Canyon Creek) is located immediately downstream of the Bass Canyon crossing. Hot Springs Canyon and Bass Canyon Creeks potentially contain five native fish species: Gila chub (Gila intermedia), longfin dace (Agosia chrysogaster), speckled dace, desert sucker (Catostomus clarki), and Sonora sucker (Catostomus insignis) (Brooks, 1985) (Table 3.2.6-4). The longfin dace is the only species occurring in Wildcat Canyon Creek. The primary importance of the stream sections below the crossings is spawning and rearing areas for young fish. Similarly, Gila chub, a state-threatened species, uses the lower section of Bass Canyon Creek for spawning and rearing in the spring and summer. Adult Gila chub are found mainly in Bass Canyon Creek, above the proposed crossing, after spawning (Brooks, 1985).

The Florence-Casa Grande Canal (Salt-Gila aqueduct) is primarily an irrigation canal that contains introduced warm water fish species (i.e., bass, channel catfish, bluegill, and threadfin shad). Also, the possibility exists that three native fish occur in this canal: the Sonora sucker, desert sucker, and Gila topminnow (Poeciliopsis occidentalis) (Weaver, 1985; BLM, 1984a, p. 3-41).

The Central Arizona Project Aqueduct, presently under construction, may contain many of the same fish species that occur in the Colorado, Salt, and Verde Rivers (Weaver, 1985; BLM, 1984a, p. 3-45).

The San Pedro River is intermittent at the proposed crossing. The longfin dace is the most abundant species when sufficient water is present. Also, the Sonora sucker and desert sucker may occur (Table 3.2.6-4), but the habitat is not adequate to support stable populations. This river is not managed as a recreational fishery.

No fish are known to inhabit the San Simon River in the vicinity of the proposed crossing. The channel is normally dry but is subject to flash floods.

2. New Mexico. The Rio Grande would be crossed south of Las Cruces, New Mexico. This segment of the Rio Grande is dry during the winter because of irrigation diversions. Although turbidity levels are high when the river is flowing, a fishery does exist (BLM, 1984a, p. 3-45). A total of 23 fish species could potentially occur in the Rio Grande near the stream crossing (Table 3.2.6-4) (Hatch, 1985).

C. Pine Springs to Midland, Texas

The Pecos River, the only perennial stream in this segment of the pipeline, would be crossed just north of the Texas Red Bluff Reservoir in New Mexico. Thirty-three fish species potentially occur near the river crossing (Table 3.2.6-4). No major aquatic system is traversed by the proposed pipeline route in Texas.

D. Threatened and Endangered Species

The Colorado squawfish (Ptychocheilus lucius), a federally listed endangered species, was once abundant in the lower Colorado River. Except for an introduction of juveniles into Copper Basin Creek below Parker Dam in 1978, the species has largely disappeared from the river in the project area. The California Department of Fish and Game plans to reintroduce more Colorado squawfish into the Colorado River at a future date.

The bonytail (Gila elegans) is a federally listed endangered species. Bonytails are primarily inhabitants of the swifter waters of large rivers of the Colorado River system. Historically, bonytails were common fish on the lower Colorado River but became rare by 1942. Presently, they exist in the upper reaches of the Colorado River although these populations are also declining. It is believed that bonytails are extinct in the California portion of the Colorado River because the swift muddy water they thrive on has been impounded and changed in character (Moyle, 1976).

The humpback (razorback) sucker (Xyrauchen texanus) was once abundant in the Colorado River and served as a major food source for the Mojave Indians. Unable to adapt to changes in the nature of the Colorado River and to competition and predation from introduced species, populations have declined but individuals occur in the project area. The species is considered endangered (Minckley, 1973; Moyle, 1976) by the California Department of Fish and Game and is a candidate species for Federal listing (CDFG, 1980).

The unarmored threespine stickleback (Gasterosteus aculeatus williamsoni) is a federally listed endangered species and is also fully protected by California state law. Most Los Angeles Basin populations have become extinct due to destruction of habitat and introduction of mosquitofish. It is now found in the headwaters of the Santa Clara River, Los Angeles County, and possibly the Santa Maria River drainage of San Luis Obispo County. It has been artificially established in the upper reaches of the Mojave River (CDFG, 1980; UTSRT, 1977).

One federally listed endangered species, the Gila topminnow, may occur in the Florence-Casa Grande Canal in Arizona when the canal is full. However, the canal and crossing are not considered critical habitat for this topminnow (Weaver, 1985).

The Gila chub is no longer being considered as a Category 1 species by the U.S. Fish and Wildlife Service because it is more widespread than originally expected. However, the Gila chub is listed as a Group 3 threatened species by the Arizona Game and Fish Department, indicating that its continued presence in Arizona could be in jeopardy in the foreseeable future (Brooks, 1985).

The Mexican tetra (Astyanax mexicanus) is listed by the New Mexico Department of Game and Fish (1983) as endangered, Group 2, which means that prospects of survival or recruitment in New Mexico are likely to be in jeopardy within the foreseeable future. The geographic range of the Mexican tetra includes the Rio Grande Valley in New Mexico and the Pecos River (NMFG, 1979).

The Pecos gambusia (Gambusia nobilis), listed by the U.S. Fish and Wildlife Service as endangered (FWS, 1984), occurs in springs, streams, and the Bitter Lake National Wildlife Refuge upstream from the Pecos River crossing.

3.2.7 TERRESTRIAL BIOLOGY

This subsection describes the plant and animal communities found along the pipeline route from POLA to Midland, Texas. Common and scientific names of species mentioned in the text are referenced as follows:

(1) Plants: Munz, 1984; Kearney and Peebles, 1942, 1951; Martin and Hutchings, 1981.

(2) Reptiles and Amphibians: Stebbins, 1966.

(3) Birds: Robbins et al., 1983; A.O.U. Committee, 1982.

(4) Mammals: Burt and Grossenheider, 1976; Hall and Kelson, 1959.

A. POLA to Blythe

1. Vegetation. The major plant communities (as defined by Munz, 1974) encountered in California by the pipeline route would be the coastal sage scrub, chaparral, valley grassland, and creosote bush scrub. These communities correspond to the major biotic communities or biomes described by Brown (1982a) as California coastal scrub, California chaparral, California valley grassland, and Sonoran desert scrub.

The coastal sage scrub is common on dry hillsides above the California valley grassland and below chaparral. It occurs in the Puente Hills-Diamond Bar area, Jarupa Mountains, San Timoteo Badlands, and hills surrounding Santa Ana Canyon. Characteristic plants are California sagebrush (Artemisia californica), white sage (Salvia apiana), black sage (S. mellifera), California encelia (Encelia californica), brittle-bush (E. farinosa), California buckwheat (Eriogonum fasciculatum), lemonadeberry (Rhus integrifolia), laurel sumac (R. laurina), yerba santa (Eriodictyon trichocalyx), golden yarrow (Eriophyllum confertiflorum), prickly pear (Opuntia spp.), and Our Lord's candle (Yucca whipplei) (William Brothers, 1976, p. 2A.6-24).

Chaparral is a dominant community in southern California. California chaparral forms a dense cover of woody shrubs up to 10 or 15 ft high. Patches of this community are present in the San Timoteo Badlands; extensive stands occur on lower slopes of the San Bernardino, San Gabriel, and San Jacinto mountains. Characteristic plants are chamise (Adenostoma fasciculatum), scrub oak (Quercus dumosa), mountain-mahogany (Cercocarpus betuloides), ceanothus (Ceanothus spp.), holly-leaf cherry (Prunus ilicifolia), manzanita (Archtostaphylos spp.), toyon (Heteromeles arbutifolia), redberry (Rhamnus spp.), sugar bush (Rhus ovata), and poison oak (Toxicodendron diversiloba) (William Brothers, 1976, p. 2A.6-26).

The California grassland is an annual grassland that has been subjected to more than 200 years of grazing. More recently, it is being replaced by urbanization and cultivation. Disagreement exists on the prehistoric composition of California's grassland, specifically whether annuals or

perennials dominated. Communities today are characterized by bromegrass (Bromus spp.), wild oats (Avena fatua), fescue (Festuca spp.), and mustard (Brassica spp.).

Riparian woodland is a medium-sized tree community associated with streams and drainages. In mountain areas, trees are close together and a shrub understory is present; in dry washes, trees and shrubs are scattered. This plant community is present in the Whittier Narrows, Santa Ana River, and San Timoteo Canyon. Williams Brothers (1976, p. 2A.6-25) characterized the riparian woodland of San Timoteo Canyon as consisting primarily of arroyo willow (Salix lasiolepis), Fremont cottonwood (Populus fremontii), tree tobacco (Nicotiana glauca), tree of heaven (Ailanthus altissima), and giant reed (Arundo donax).

Remnants of the southern oak woodlands occur in the Puente, Brea, and San Jose Hills. As with the California Valley grassland, the area occupied by this community has been greatly reduced through urbanization. Characteristic species are California live oak (Quercus agrifolia), Englemann oak (Q. engelmannii), and California black walnut (Juglans californica). Understory species are typical of those in neighboring grassland, coastal sage scrub or chaparral communities (Williams Brothers, 1976, p. 2A.6-27).

Williams Brothers (1976, p. 2A.6-30) characterized vegetation in the vicinity of the proposed pipeline between Beaumont and West Palm Springs as a transitional community characterized by goldenbush (Haplopappus linearifolius), California buckwheat, desert willow (Chilopsis linearis), brittle-bush, yerba santa, and Mojave yucca (Yucca schidigera).

Near West Palm Springs, the proposed pipeline would enter in the California Sonoran Desert [also called the Sonoran Colorado Desert of California by Barbour and Major (1977)]. Creosote bush scrub is the most widespread vegetation type in this region. Dominated by creosote bush (Larrea tridentata) and bursage (Ambrosia dumosa), it occurs throughout vast intermountain bajadas. The proposed pipeline route would encounter this vegetation type from West Palm Springs east through the Coachella Valley to just west of Desert Center. Diverse stands on lower-elevation rocky slopes of the San Jacinto mountains include cismontane species such as bladderpod (Isomeris arborea) and California buckwheat, and Mojave species such as senna (Cassia armarta) and pigmy-cedar (Peucephyllum schottii). Other species present on these slopes include goatnut (Simmondsia chinensis), mammillaria cactus (Mammillaria tetrancistra), hedgehog cactus (Echinocereus englemannii), terpentine-broom (Thamnosma montana), and sage (Salvia vaseyi) (Burk, 1977). Sand accumulation on bajadas supports other species such as Coldenia palmeri, croton (Croton californicus), indigo bush (Dalea schottii, D. emoryi), big galleta (Hilaria rigida), and long-leaved joint fir (Ephedra trifurca). A saltbush community was common in California's Coachella Valley before cultivation. Usually found on gently sloping lands and valleys, the community is characterized by saltbush (Atriplex polycarpa), screwbean mesquite (Prosopis pubescens), and goldenbush (Haplopappus acradenius) (Turner and Brown, 1982).

Limited cactus scrub communities would be encountered several times along the proposed route near White Water and Cactus City. They are usually surrounded by vegetation of the creosote bush scrub community. Characteristic species include jumping cholla (Opuntia bigelovii), other Opuntia spp., hedgehog cactus, and barrel cactus (Ferocactus acanthodes) (Burk, 1977).

The most extensive wash woodland community would be encountered primarily in the Chuckwalla Valley. It occurs on margins of arroyos in the California Sonoran Desert as a relatively dense growth of trees. Common species include palo verde (Cercidium floridum), ironwood (Olneya tesota), smoke tree (Dalea spinosa), Anderson thornbush (Lycium andersonii), mesquite (Prosopis glandulosa), broom baccharis (Baccharis sarathroides), Condaliopsis lycioides, and desert willow (Williams Brothers, 1976, p. 2A.6-32).

A palm oasis occurs in the vicinity of the proposed pipeline near Indio. This community, dominated by California fan palm (Washingtonia filifera), is limited to sites with a permanent water supply (Williams Brothers, 1976, p. 2A.6-32).

Alkalai sinks occur in the vicinity of the proposed Colorado River crossing. This low elevation, wet, high salinity environment supports vegetation dominated by iodine bush (Allenrolfea occidentalis) and sea-blite (Suaeda torreyana). Areas frequently flushed of salt build up support tamarisk or salt cedar (Tamarix chinensis) and arrowweed (Pluchea sericea). Other phreatophytes include screw-bean mesquite, seepwillow (Baccharis glutinosa), saltbush (Atriplex lentiformis), gooding willow (Salix goodingii), and Fremont cottonwood (Williams Brothers, 1976, p. 2A.6-35).

2. Wildlife.

a. Reptiles and Amphibians. Approximately 19 species of amphibians occur or potentially occur from Los Angeles to Blythe. These species include the Monterey salamander (Ensatina eschscholtzi eschscholtzi), slender salamanders (Batrachoseps spp.), arboreal salamander (Aneides lugubris), coast range newt (Taricha torosa torosa), spadefoot toad (Scaphiopus spp.), toad (Bufo spp.), treefrog (Hyla spp.), and frogs (Rana spp.). The desert slender salamander (Batrachoseps aridus) is a federally listed endangered species. Approximately 80 reptile species occur in the vicinity of the proposed pipeline in southern California. Reptiles of the coastal sage scrub include the California side-blotched lizard (Uta stansburiana hesperis), San Diego coast-horned lizard (Phrynosoma coronatum blainvillei), coastal whiptail (Cnemidophorus tigris multiscutatus), orange-throated whiptail (C. hyperthrus), coastal rosy boa (Lichanura trivirgata roseofusca), and California striped racer (Masticophis lateralis lateralis) (Pase and Brown, 1982).

Reptiles restricted to chaparral include the San Diego alligator lizard (Gerrhonotus multicarinatus webbi), granite night lizard (Xantusia henshawi), and striped racer (Masticophis lateralis). Other reptiles expected in the California chaparral are the western fence lizard (Sceloporus occidentalis), sagebrush lizard (S. graciosus), and coast horned lizard (Phrynosoma coronatum) (Pase, 1982).

Reptiles of the creosote bush scrub community include the desert tortoise (Gopherus agassizi) (Figure 3.2.7-1), the desert iguana (Dipsosaurus dorsalis), chuckwalla (Sauromalus obesus), fringe-toed lizards (Uma spp.), desert spiny lizard (Sceloporus magister), flat-tailed horned lizard (Phrynosoma m'calli), and the sidewinder (Crotalus cerastes) (Stebbins, 1972).

b. Birds. An estimated 300 species of birds are known to occur in southern California.

Common species in the chaparral include scrub jay (Aphelocoma coerulescens), brown towhee (Pipilo fuscus), Bewick's wren (Thryomanes bewickii), orange-crowned warbler (Vermivora celata), bushtit (Psaltriparus minimus), and Lazuli bunting (Passerina amoena). Species somewhat confined to California chaparral include California quail (Callipepla californica), wrentit (Chamaea fasciata), and Anna's hummingbird (Calypte anna). A bird diagnostic of the Lower Colorado subdivision of the Sonoran Desert is Le Conte's thrasher (Toxostoma lecontei). Birds characteristic of the Southern Oak woodland include acorn woodpecker (Melanerpes formicivorus), Nuttal's woodpecker (Picoides nuttallii), and western bluebird (Sialia mexicana). Sonoran riparian species include Crissal thrasher (Toxostoma dorsale), Abert's towhee (Pipilo aberti), and black-tailed gnatcatcher (Polioptila melanura) (Brown, 1982a).

c. Mammals. There are an estimated 200 species of mammals in southern California. Characteristic species of the coastal sage scrub community include the Pacific kangaroo rat (Dipodomys agilis) and San Diego pocket mouse (Perognathus fallax). Common species of the California chaparral include brush rabbit (Sylvailagus bachmani), California mouse (Peromyscus californicus), mule deer (Odocoileus hemionus), gray fox (Urocyon cinereoargenteus), Merriam chipmunk (Eutamias merriami), dusky-footed woodrat (Neotoma fuscipes), agile kangaroo rat, California pocket mouse (Perognathus californicus), and brush mouse (Peromyscus boylii).

Large mammals of the Lower Colorado River Valley region of California include the desert bighorn sheep (Ovis canadensis nelsoni) (Figure 3.2.7-2), burro deer (Odocoileus hemionus eremicus), the ubiquitous coyote (Canis latrans), and the introduced burro (Equus asinus). High diurnal temperatures of the region are largely avoided by the host of burrowing rodents that populate the area such as the characteristic round-tailed ground squirrel (Citellus tereticaudus). Other more widespread species include the kit fox (Vulpes macrotis), white-tailed antelope squirrel (Ammospermophilus leucurus), desert pocket mouse (Perognathus penicillatus), long-tailed pocket mouse (Perognathus formosus), desert kangaroo rat (Dipodomys deserti), and Merriam's kangaroo rat (D. merriami).

Common species of the woodland include California mule deer (Odocoileus hemionus californicus), California ground squirrel (Citellus beecheyi), valley pocket gopher (Thomomys bottae), and raccoon (Procyon lotor) (Brown, 1982b).

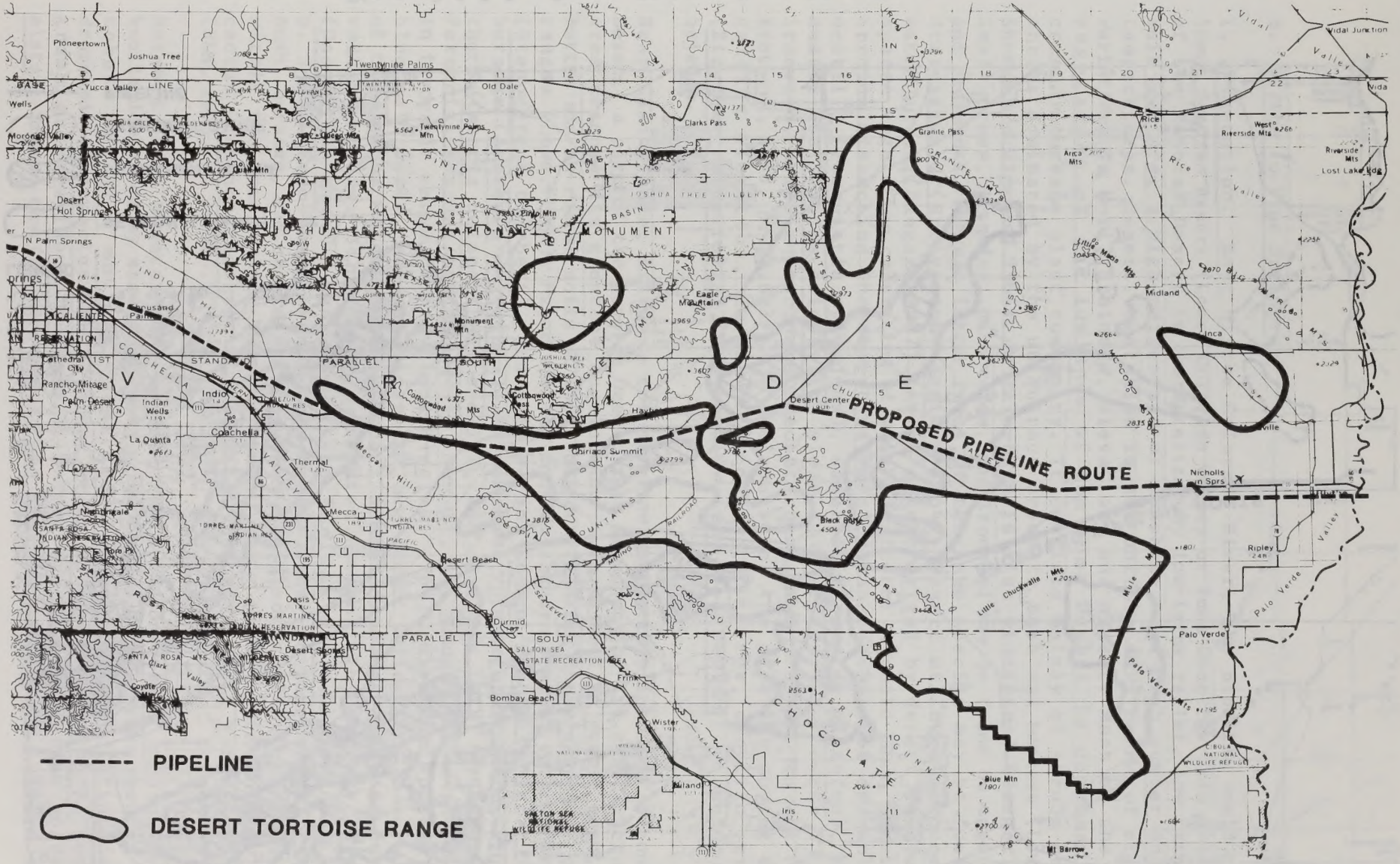


Figure 3.2.7-1 - Distribution of Desert Tortoise Along Proposed Pipeline Route (BLM, 1979b)

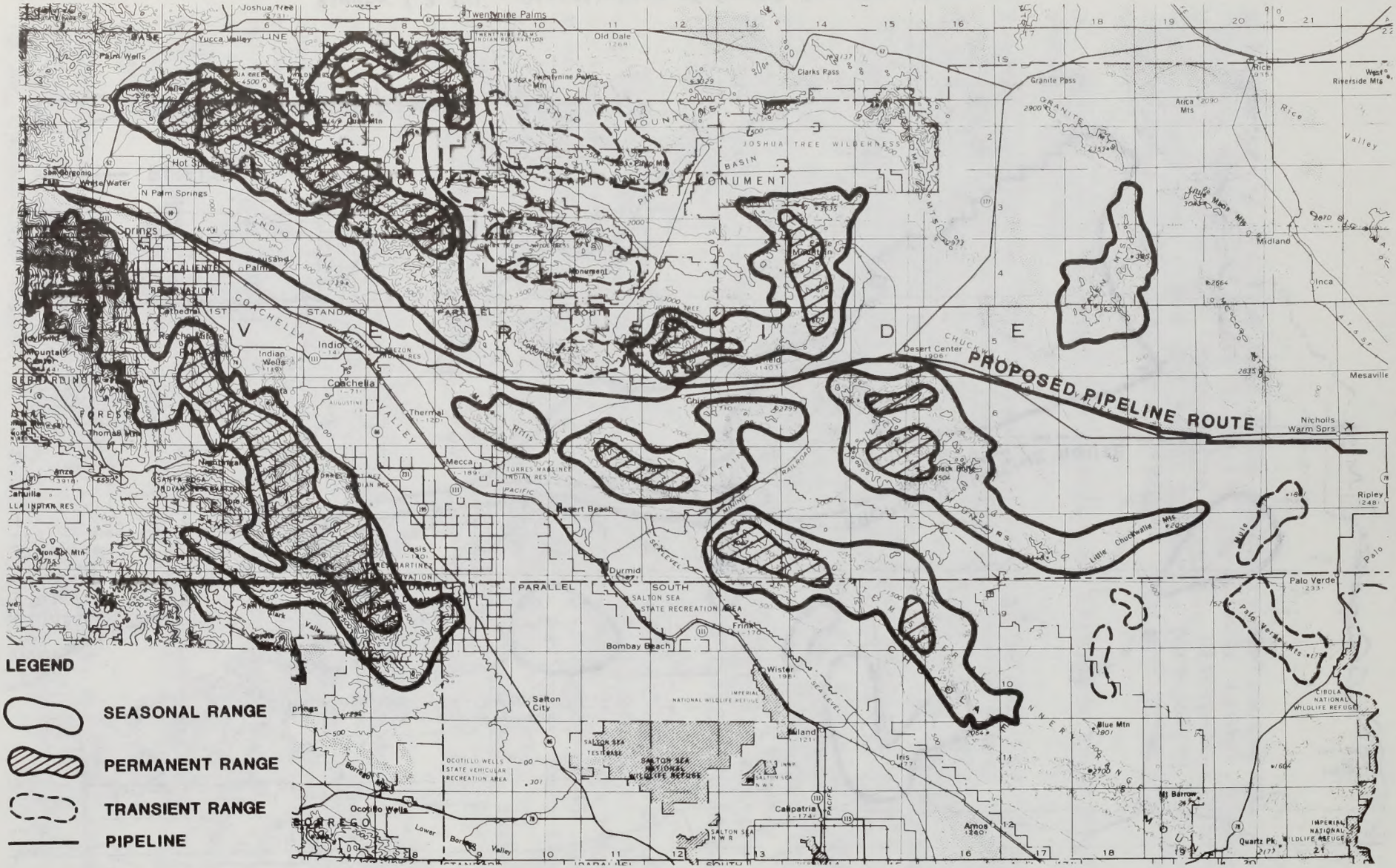


Figure 3.2.7-2 - Desert Bighorn Sheep Distribution
(BLM, undated)

B. Blythe to Pine Springs

1. Vegetation. East of the Colorado River, the pipeline would cross the lower Sonoran Desert (Lower Colorado Valley or Yuma Desert). This subdivision of the Sonoran Desert is characterized by low-lying relief, low rainfall and soil moisture, a high percentage of sunshine, and high summer and winter temperatures. Desert vegetation is not uniform as a result of significant variations in soil, drainage, elevation, and aspect. Much of the natural vegetation of the lowlands of the Yuma Desert is composed of the creosote-bursage plant community. It consists mainly of shrubs and dwarf shrubs dominated by the ubiquitous creosote bush and bursage (Lowe, 1964; Shreve and Wiggins, 1964). Brittle-bush is also widespread (Jaeger, 1957). Small trees, mesquite, palo verde, and ironwood may be found on upper bajadas and pediments, whereas larger trees of the same species may be found along drainageways (Shreve and Wiggins, 1964). Desert willow also occurs along watercourses (Jaeger, 1957). Areas characterized by desert pavement have sparse vegetation consisting of widely scattered creosote bush. Vegetation in arroyos dissecting the desert pavement areas consists of creosote bush, ocotillo (Fouquieria splendens), saguaro (Carnegiea gigantea), and fairy duster (Calliandra eriophylla) along the edges; palo verde, bursage, ironwood, brittle-bush, and creosote bush inhabit arroyo bottoms (Williams Brothers, 1976, p. 2A.6-39). In the course of the pipeline moving east and gaining elevation, it would encounter saguaros, ocotillo, graythorn (Zizyphus obtusifolia), and catclaw (Acacia greggii) on well-drained bajadas.

Near Casa Grande, Arizona, the pipeline would cross into the Arizona Upland Desert, a part of the Sonoran Desert that is known for its giant cactus. This area reaches its greatest development on rocky soil of desert mountains and buttes and on coarse soils of upper bajadas flanking rocky slopes of mountain ranges (Lowe, 1964). Major species include saguaro, barrel cactus, organ pipe (Stenocereus thurberi), and palo verde. Common shrubs include triangle bursage (Ambrosia deltoidea), brittle-bush, creosote, ironwood, crucifixion thorn (Canotia holacantha), chollas, and ocotillo (BLM, 1984a, p. 3-55). Perennial grasses may be locally abundant, and annuals may carpet the ground in favorable seasons (Shreve and Wiggins, 1964). Riparian species include blue palo verde, mesquite, catclaw, and desert willow. The eastern portions of the Arizona Upland Desert support dense stands of creosote bush along valley floors. Slopes are dominated by ocotillo, prickly pear, sotol (Dasylirion spp.), and sacahuista (Nolina microcarpa) (BLM, 1984a, p. 3-55). From the Florence-Casa Grande Canal to Black Mountain, creosote bush, bursage, and cholla are found on sandy soils. Other species present within the area include barrel cactus, jumping cholla, prickly pear, hedgehog cactus (Echinocereus spp.), mesquite, ironwood, palo verde, and saguaro (BLM, 1976, p. 2-350).

Between Black Mountain and Oracle, the area consists of rolling hills with knolls dominated by stands of grama grass-tobosa grass. Grass species include tobosa (Hilaria mutica), assorted three-awn species (Aristida spp.), dropseeds (Sporobolus spp.), black grama (Bouteloua eriopoda), and other grama grasses (Bouteloua spp.). Interspersed are soaptree yucca (Yucca elata), Mormon tea (Ephedra spp.), and prickly pear (BLM, 1976, p. 2-350).

Near Oracle, Arizona, the pipeline would cross a small area of oak-pine woodland mixed with a mosaic of riparian and desert scrub communities. Common tree species include Emory oak (Quercus emoryi), Arizona oak (Q. arizonica), alligator juniper (Juniperus deppeana), Apache pine (Pinus cembroides), and Mexican pinon pine (P. engelmannii) (BLM, 1984a, p. 3-56). The area from Oracle to the San Pedro River represents the eastern portion of the Arizona Upland Desert Biome and supports relatively dense stands of creosote bush along valley floors. Slope vegetation is predominantly ocotillo and prickly pear, with sotol and sacahuista occurring at higher elevations.

South-facing slopes have scattered saguaro and palo verde, whereas juniper inhabit the north-facing slopes. Where the pipeline would cross the San Pedro River, the river is intermittent and riparian vegetation is limited to an occasional cottonwood (BLM, 1976, p. 2-350).

The region between the San Pedro River and the west side of the Winchester Mountains represents an ecotone between the Arizona Upland Desert Biome and the Desert Grassland Biome. Correspondingly, the region is a mosaic of desert shrub and desert grassland vegetation. Creosote bush is dominant in the desert shrub stands. The desert grassland occurs in the hilly area, which is dissected by numerous arroyos. Hilltops are occupied by fairly open grassland interspersed with soaptree yucca, banana yucca (Yucca baccata), and catclaw. In this area, the desert grassland can be classified as a grama-grass yucca vegetation stand. Grass species include a number of grama grasses: black, blue (Bouteloua gracilis), hairy (B. hirsuta), and sideoats (B. curtipendula). Arroyos are lined with sacahuista and prickly pear (BLM, 1976, p. 2-351).

Where the pipeline would cross about 4 miles of steep terrain in the Winchester Mountains, the area presents a complex mosaic of plant communities. Consequently, the vegetation cannot be identified by a single type. South-facing slopes are primarily desert hornbush (Ceanothus greggii), a chaparral species. North-facing slopes have an oak overstory and a grassland understory. Arborescent species on the north-facing slopes include emory oak, Arizona oak, scrub oak (Q. turbinella), and juniper (Juniperus spp.). Important understory species of these slopes are sacahuista and prickly pear (BLM, 1976, p. 2-351). In the floodplains of Hot Springs Canyon, native desert riparian communities occur, dominated by cottonwood (Populus spp.), western sycamore (Platanus racemosa), mesquite, and velvet ash (Fraxinus pennsylvanica var. velutina). The pipeline would cross the Muleshoe Nature Preserve managed by the Arizona Nature Conservancy (BLM, 1984a, p. 3-56).

The Desert Grassland biome, a transition between the Sonoran and Chihuahuan Deserts (Lowe, 1976), reaches from near the east slope of the Winchester Mountains in Arizona to the vicinity of Mondel, New Mexico. The major portion of this biome occurs at lower elevations and is noted by the absence of trees. The vegetation stands in this region can be classified as mesquite grassland. Grasses include the grama, dropseed, and tobosa grasses. Other species include creosote bush, crucifixion thorn, catclaw, and snakeweed (Gutierrezia spp.), which gives the landscape a mosaic appearance (BLM, 1976, p. 2-352).

The pipeline route traverses the Chihuahuan Desert biome from western New Mexico to the Pecos River. Along the western edge of this biome near Mondel and Gary, New Mexico, the pipeline would cross several miles of salt playas devoid of vegetation. Although dominated by creosote bush, the Chihuahuan Desert differs from the Sonoran Desert by lacking bursage and saguaro. The occurrence of codominant species and their distribution is a function of soil conditions and topography. On level terrain or gently sloping bajadas, as typically occurs between Lordsburg and Deming, New Mexico, predominantly sandy soils support grasses, ocotillo, honey mesquite (Prosopis glandulosa), soaptree yucca, banana yucca and four-wing saltbush (Atriplex canescens) (BLM, 1984a, p. 3-56). Where honey mesquite and grass species dominate the community, the area is sometimes referred to as mesquite grassland (BLM, 1976, p. 2-354). Along arroyo banks are junipers, Mormon tea, lechuguilla (Agave lechugilla), purple prickly pear (Opuntia violacea var. santarita), and sotol. In arroyos, desert sumac (Rhus microphylla), western hackberry (Celtis reticula), and/or desert willow may be found. Shallow soils, heavy limestone soils, and dune depressions have creosote bush, honey mesquite, tobosa grass, grama, and dropseed grasses (BLM, 1984a, p. 3-56). Much of the natural vegetation near Deming and Lordsburg, New Mexico, has been replaced by agricultural development.

Proceeding eastward from Deming, the pipeline would encounter mesquite dunes. Blowing sand from unstable soils accumulate around honey mesquite forming dunes. Mesquite dunes support four-wing saltbush, mesquite, snakeweed, broom pea, and patches of creosote bush (BLM, 1984a, p. 3-56).

2. Wildlife.

a. Reptiles and Amphibians. Despite the physiognomic simplicity of the creosote bush-bursage plant community, it contains a diverse and abundant reptilian fauna. Several species, dependent on easily friable or sandy soils for their existence, include the desert tortoise, Colorado Desert fringe-toed lizard (Uma notata), western shovel-nosed snake (Chionactis occipitalis), banded sand snake (Chilomeniscus cinctus), sidewinder (Williams Brothers, 1976, p. 2A.7-13), and flat-tailed horned lizard (BLM, 1984a, p. 3-57). Reptiles considered somewhat characteristic of the creosote bush-bursage community include the desert iguana, chuckwalla, zebra-tailed lizard (Callisaurus draconoides), and western shovel-nosed snake (Williams Brothers, 1976, p. 2A.7-13). Rocky outcrops, bajadas, talus slopes, washes, and gravel plains support the desert spiny lizard (Sceloporus magister magister), long-tailed brush lizard (Urosaurus graciosus), southern desert horned lizard (Phrynosoma platyrhinos calidiarum), western whiptail (Cnemidophorus tigris), and desert glossy snake (Arizona elegans eburnata) (Turner and Brown, 1982).

Many of the reptile species common to the creosote bush-bursage plant community also occur in the palo verde-saguaro plant community. Commonly occuring reptile species, which can be considered somewhat characteristic of the palo verde-saguaro community, include the regal horned lizard (Phrynosoma solare), gila monster (Heloderma suspectum), and the Arizona coral snake (Micruroides euryxanthus) (BLM, 1976, p. 2-582).

Common reptile species of the oak-pine woodland plant community include the Sonora mud turtle (Kinosternon sonoriense), Clark's spiny lizard (Sceloporus clarki), Arizona alligator lizard (Gerrhonotus kingi), and ringneck snake (Diadophis punctatus) (Williams Brothers, 1976, p. 2A.7-14).

Species of the reptilian fauna common to and characteristic of the Chihuahuan Desert include the round-tailed horned lizard (Phrynosoma modestum) and Trans-Pecos rat snake (Elaphe subocularis).

b. Birds. Below the proposed pipeline crossing of the Colorado River, large manmade wetlands comprised of riparian scrubland and open water are present. These wetland areas were established to mitigate impacts to wildlife associated with dredging in the Colorado River. Extensive wetlands also occur 20 miles downstream of the crossing in Cibola and Imperial National Wildlife Refuges (NWRs). The scrublands and quiet backwaters immediately downstream of the crossing provide habitat for resident and migratory waterfowl and marshbirds (BLM, 1984a, p. 3-57). Yuma clapper rail (Rallus longirostris yumanensis) have been reported for the wetlands in the NWRs (Powell, 1985).

The breeding avifauna of the creosote bush-bursage community exhibits low diversity when compared to the avifauna of other southwestern deserts. One study reported 17 species of birds breeding in an area of creosote bush-bursage but three species - the verdin (Auriparus flaviceps), cactus wren (Campylorhynchus brunneicapillus), and black-throated sparrow (Amphispiza bilineata) - comprised 53% of the avian breeding population. The cactus wren, which commonly nests in cholla cactus, occurs throughout the creosote-bursage community wherever cactus is abundant. Particulary productive wildlife habitat occurs from near the proposed Gila River crossing, south to the Painted Rock Reservoir, which is important to three game species: white-winged dove (Zenaida asiatica), mourning dove (Zenaida macroura), and Gambel's quail (Callipepla gambelii) (BLM, 1976, pp. 2-575 to -577).

The avifauna of the palo verde-saguaro community is by far the richest in numbers of individuals and species of all of the North American deserts. The increased abundance and diversity of the avian population of the palo verde-saguaro community is directly related to the greater structural diversity of the vegetation. This is the result of the increased abundance of several plant species such as the saguaro, palo verde, mesquite, ironwood, and numerous species of cacti. The most common breeding species are the white-winged dove, mourning dove, verdin, and phainopepla (Phainopepla nitens) (BLM, 1976, p. 2-583).

The avifauna of the oak-pine woodland plant community is a unique mixture of bird species from the oak-pine woodland and the ponderosa pine forest above. In this community, particularly in riparian areas, Arizona's avifauna achieves greatest diversity and abundance. The most abundant breeding bird species include the northern mockingbird (Mimus polyglottos), black-throated gray warbler (Dendroica nigrescens), black-chinned hummingbird (Archilochus alexandri), and bridled titmouse (Parus wollweberi) (BLM, 1976, p. 2-589).

Although the San Pedro River is an intermittent stream, sensitive or unusual raptor species occur along its course upstream and downstream from the proposed pipeline crossing. Species of concern are the gray hawk (Buteo nitidus), zone-tailed hawk (Buteo albonotatus), and Mississippi kite (Ictinia mississippiensis) (Weaver, 1984).

Most of the avian species that occur in the Chihuahuan desert are those that also range widely over other deserts of the southwestern United States. The avifauna of the Chihuahuan Desert is generally poorer in number of bird species than other North American deserts because of the lack of vertical complexity of the vegetation. Most bird species use the vegetation of arroyos and washes for breeding sites. The basic avifuana of the Chihuahuan Desert includes the mourning dove, verdin, crissal thrasher, black-tailed gnatcatcher, and black-throated sparrow (BLM, 1976, p. 2-595).

c. Mammals. Many mammalian species found in the Sonoran Desert are also species common to warmer and drier regions of the Southwest. Typical species include the California leaf-nosed bat (Macrotus californicus), coyote (Canis latrans), ringtailed cat (Bassariscus astutus), black-tailed jackrabbit (Lepus californicus), desert cottontail (Sylvilagus auduboni), Merriam's kangaroo rat, white-throated woodrat (Neotoma albigula), and desert pocket mouse. The desert kangaroo rat, Bailey's pocket mouse (Perognathus baileyi), and the round-tailed ground squirrel are more restricted in range but common to the Sonoran Desert. The Arizona cactus mouse (Peromyscus eremicus eremicus) is adapted to Sonoran Desert scrub communities (Turner and Brown, 1982).

Other mammalian species common to the creosote bush-bursage community are mule deer and bighorn sheep (Ovis canadensis). Both species are generally restricted to mountainous areas but local movements, particularly by mule deer, may take them onto creosote bush flats (BLM, 1976, p. 2-578). Riparian communities in the Sonoran Desert support additional species, including the racoon, silver-haired bat (Lasionycteris noctivagans), and big brown bat (Eptesicus fuscus).

The rodent population of the palo verde-saguaro community is at least equally as abundant in individuals and diverse in species as that of the creosote bush-bursage community. Up to nine species of rodents have been reported coexisting on a single acre of the palo verde-saguaro community. These include Ord's kangaroo rat (Dipodomys ordi), the banner-tailed kangaoo rat (Dipodomys spectabilis), Merriam's kangaroo rat, hispid pocket mouse (Perognathus hispidus), Arizona pocket mouse and desert pocket mouse, deer mouse (Peromyscus maniculatus), southern grasshopper mouse (Onychomys torridus), and the northern grasshopper mouse (Onychomys leucogaster). Other species present may include black-tailed jackrabbit, coyote, gray fox, spotted skunk (Spilogale putorius), and silky pocket mouse (Perognathus flavus) (BLM, 1976, pp. 2-584 to -585).

Characteristic mammals of the oak-pine woodland include the racoon, coati (Nasua narica), mountain lion (Felis concolor), peccary (Tayassu tajacu=Pecari angulatus), and mule deer. Other mammals characteristic of this plant community include the brush mouse (Peromyscus boylei), spotted

skunk, hognose skunk (Conepatus leuconotus), and rock pocket mouse (Perognathus intermedius) (Williams Brothers, 1976, p. 2A.7-31).

Few mammals are restricted to Chihuahuan desert scrub. Common species include desert pocket gopher (Geomys arenarius), Mexican pocket gopher (Pappogeomys castanops), Nelson's pocket mouse (Perognathus nelsoni), Southern grasshopper mouse, Texas antelope squirrel (Ammospermophilus interpres), and desert pocket mouse. Other species present, but with greater distribution ranges, include desert shrew (Notiosorex crawfordi), desert mule deer (Odocoileus hemionus crooki), desert bighorn sheep (Ovis canadensis mexicana), Merriam's kangaroo rat, and desert cottontail (Brown, 1982c).

C. Pine Springs to Midland

1. Vegetation. The pipeline route would traverse the Trans-Pecos desert scrub from the vicinity of the Guadalupe Escarpment to the Pecos River region. The Trans-Pecos is a region of diverse habitats and vegetation, varying from desert valleys to wooded mountain slopes. At higher elevations, junipers and oaks are abundant. On lower slopes, dominant species include agave (Agave spp.), yucca, sotal, and various grasses such as grama, muhly (Muhlenbergii spp.), alkalai sacaton (Sporobolus airoides) and vine mesquite (Panicum obtusum). On gravelly plains, tarbush (Flourensia cernua), creosote bush, catclaw and mesquite occur. The Pecos River is the eastern terminus of the Trans-Pecos region. Riparian vegetation occurs as salt-cedar in almost pure stands (BLM, 1984a, p. 3-56).

The Guadalupe National Park occurs north of the pipeline route. The park preserves unique combinations of desert and forest plants. The Gypsum Dunes Nature Preserve managed by the Texas Natural Heritage Program occurs near the route south of Guadalupe National Park. This area has unique dune communities that are rare in western Texas (BLM, 1984a, p. 3-60).

Near Jal, New Mexico, a transition to grassland vegetation occurs. The vegetation may be classified as semiarid, short-grass prairie (Williams Brothers, 1976). The most abundant grass species include buffalo grass (Buchloe dactyloides), blue grama, sideoats grama, black grama, little bluestem (Andropogon spp.), western wheatgrass (Agropyron smithii), Indian grass (Sorghastrum nutans), and switchgrass (Panicum virgatum). In addition to these grasses, significant stands of mesquite, creosote bush, sage (Salvia spp.), and shin oak (Querus havardii) are found throughout the area. Various forbs and weedy species include sunflower (Helianthus spp.), Russian thistle (Salsola kali), pigweed (Amaranthus spp.), and horseweed (Erigeron canadensis) (Williams Brothers, 1976, p. 2A.6-43).

Perennial short-grass prairie is disturbed over large areas because of cultivation practices and overgrazing. In addition to grama grasses and buffalo grass, sand dropseed becomes dominant. Snakeweed is a codominant of the area with plains yucca and honey mesquite as subdominants. Honey mesquite stabilizes blowing sand forming dunes. Associated with mesquite dunes are snakeweed, shin oak, and sand sage (Artemisia filifolia). Bluestem will inhabit blowouts in sandy soil (William Brothers, 1976, p. 2A.6-43).

2. Wildlife.

a. Reptiles and Amphibians. Herpetofauna common to the Chihuahuan Desert of the Pine Springs to Midland pipeline segment are similar to those found in the Chihuahuan Desert of the Blythe to Pine Springs pipeline segment. In addition, the herpetofauna of the portion of the Trans-Pecos Desert scrub crossed by the pipeline is similar to that of the surrounding Chihuahuan Desert. Amphibian species found in the Trans-Pecos Desert scrub include the tiger salamander (Ambystoma tigrinum), spadefoot toad, toads, cricket frog (Acris crepitans), leopard frog (Rana pipiens), and bullfrog (R. catesbeiana). These same species occur in the semiarid short-grass prairie, as well as additional species of Scaphipos and Bufo (Williams Brothers, 1976, p. 2A.7-114).

The reptilian fauna of the Trans-Pecos Desert scrub and the Chihuahuan Desert of the Pine Springs to Midland pipeline segment is similar to that of the Chihuahuan Desert of the Blythe to Pine Springs pipeline segment.

Reptilian species characteristic of the semiarid short grass prairie include the six-lined racerunner (Cnemidophorus sexlineatus), spotted whiptail (Cnemidophorus gularis), ground snake (Sonora episcopa), and plains blackheaded snake (Tantilla nigriceps) (Williams Brothers, 1976, p. 2A.7-17).

b. Birds. Avian species occurring in the Chihuahuan Desert are discussed in subsection 3.2.7.B.2.b. Conspicuous breeding birds in the Trans-Pecos Desert scrub include the scrub jay, curve-billed thrasher (Toxostoma curvirostre), gray vireo (Vireo vicinior), brown towhee (Pipilo fuscus), and black-chinned sparrow (Spizella atrogularis). Avian populations of the semiarid short-grass prairie are depauperate when compared with avian populations of other North American grasslands. Ground-associated forms that dominate the avifauna of other grasslands are lacking and brush associated, with air-feeding forms predominate (Williams Brothers, 1976, p. 2A.7-28). Other well-distributed nesting species include Swainson's hawk (Buteo swainsoni), prairie falcon (Falco mexicanus), American kestrel (Falco sparverius), mourning dove, scaled quail (Callipepla squamata), burrowing owl (Athene cunicularia), ash-throated flycatcher (Myiarchus cinerascens), Say's phoebe (Sayornis saya), Chihuahuan raven (Corvus cryptoleucus), verdin, eastern meadowlark (Sturnella magna), western meadowlark (S. neglecta), and horned lark (Eremophila alpestris) (Brown, 1982d).

c. Mammals. Mammalian species found in the Chihuahuan Desert of the Pine Springs to Midland pipeline segment are similar to those found in the Blythe to Pine Springs pipeline segment. Mammals characteristic of the Trans-Pecos Desert scrub include the gray fox, white-footed mouse (Peromyscus leucopus), white-ankled mouse (Peromyscus pectoralis), and desert cottontail. Mammals characteristic of the semiarid short-grass prairie include the swift fox (Vulpes macrotis); Mexican pocket gopher; plains pocket mouse (Perognathus flavescens) (Williams Brothers, 1976); black-tailed jackrabbit; spotted ground squirrel (Citellus spilosoma); hispid pocket mouse; Ord's, Merriam, and banner-tailed kangaroo rats;

white-footed mouse; cotton rats (Sigmodon spp.); southern grasshopper mouse; southern plains woodrats (Neotoma micropus) and white-throated woodrats; badger (Taxidea taxus); and coyote (Brown, 1982d).

D. Threatened, Endangered, and Special-Status Species and Communities

Many threatened, endangered, or special-status species occur or may occur in the project area (see Appendix I, Table I.1-1).

Several plant species that are candidates for Federal listing may occur in the project area. The Coachella Valley milk vetch (Astragalus lentigenosus var. coachellae) is known to occur along the proposed pipeline route north of Palm Springs in the Coachella Valley. The Alverson's foxtail cactus (Coryphantha vivipara var. alversonii) occurs north of the proposed pipeline near the McCoy Mountains. California ditaxis (Ditaxis californica) is found in the Lost Palms Canyon of the Eagle Mountains, and along the pipeline route west of Desert Center. Flat-seeded spurge (Euphorbia platysperma) occurs in the Coachella Valley south of Highway 60 (Knehr, 1985). Nevin's barberry (Mahonia nevinii), a species of the coastal sage scrub and chaparral, is reported in San Timoteo Canyon near Redlands (Munz, 1974; Krantz, 1985). Little San Bernardino Mountain linanthus (Linanthus maculatus) is known from San Gorgonio Pass (Krantz, 1985).

Several species of commercially valuable cactus occur along the route in Arizona. These species are protected by Arizona law and will be salvaged prior to construction. Sneed's pincushion cactus, a federally listed endangered species, occurs near the pipeline route in New Mexico and Texas in the Anthony Gap area. Although critical habitat has not been designated for this species, it occurs only in the Franklin Mountains of New Mexico and Texas and the Guadalupe Mountains in Texas. It is found on limestone ledges in desert grasslands between 4,300 and 5,400 ft (BLM, 1984a, p. 3-59). Surveys of the All-American route indicated that no populations occurred in the ROW. Gypsum wild-buckwheat (Eriogonum gypsophilum), a federally listed threatened species, is known to occur near the pipeline ROW in Eddy County, New Mexico. Extrapolation of habitat requirements of the species to similar habitats believed to occur near the route in Culberson County, Texas, lead regional biologists to expect more populations of the species to be found in this area (Juen, 1985).

McKittrick pennyroyal (Hedeoma apiculatum), a federally listed threatened species, is known to occur in Culberson County, Texas, and Eddy County, New Mexico north of the proposed pipeline route. Lee's pincushion cactus (Coryphantha sneedii var. leei), a federally listed endangered species, inhabits limestone slopes, ledges, and ridgetops. It is known from Eddy County, New Mexico, west of the Pecos River crossing. Lloyd's hedgehog cactus (Echinocereus lloydii), a federally listed endangered species, was recently discovered in the Guadalupe Mountains, Texas. Further field studies of Lloyd's hedgehog cactus, McKittrick pennyroyal, gypsum wild-buckwheat, and Sneed's pincushion cactus are necessary to confirm their proximity to the Pactex pipeline.

The Coachella Valley fringe-toed lizard (Uma inornata) is listed by the U.S. Fish and Wildlife Service as threatened. The proposed route crosses 6 miles of U.S. FWS-designated critical habitat. It is associated with the blowsand ecosystem of the Coachella Valley in California (see Figure 3.2.7-3). Increasing urban and agricultural development has reduced the animal's historic range. Also associated with this ecosystem is the flat-tailed horned lizard (Phrynosoma m'calli), which is a Category 2 candidate for Federal listing. It is known to occur in the Coachella Valley and elsewhere in the Colorado Desert (CVFTL HCP, 1984). Field assessment in 1985 indicated that the proposed pipeline route would disturb approximately 0.4 mile (5 acres) of habitat which, at the date of survey, appeared to satisfy the habitat characteristics necessary for occupation by CVFTL. Because of the dynamic processes of the blowsand ecosystem, other potentially occupiable habitat along the route may become attractive to CVFTL in the future.

The San Diego horned lizard (P. coronatum blainvillei) is a Category 2 candidate for Federal listing. Its distribution includes areas west of the California Sonora and Mojave deserts and it is threatened by increasing urbanization. It is reported locally at Whittier Narrows Recreation Area (Bontrager, 1984).

The orange-throated whiptail (Cnemidophorus hyperythrus) is presently listed as a Category 2 candidate species for Federal listing. It is typically found in the coastal chaparral (Stebbins, 1972) and is reported historically from Reche Canyon and the Beaumont area (CNDDB, undated).

The Gila monster (Heloderma suspectum) is an inhabitant of lower slopes of mountains and outwash plains, as well as canyon bottoms and arroyos. It is known locally from the western base of the Providence Mountains, San Bernardino County and reported at Imperial Dam, Imperial County (Stebbins, 1972). It is a Category 2 candidate for Federal listing.

The desert tortoise (Gopherus agassizi) is a Category 2 candidate for Federal listing, as well as a BLM-listed sensitive species. Typical habitat includes rocky foothills and lower bajadas in the Sonoran and Mojave deserts. It is known to occur along the proposed pipeline south of the Little San Bernardino, Cottonwood, and Eagle Mountains (Figure 3.2.7-1). High density populations are known to occur northeast of the Chocolate Mountains.

Five federally listed endangered bird species and one bird species proposed for listing as endangered occur or potentially occur in the vicinity of the proposed pipeline. The California least tern (Sterna antillarum browni) is known to nest in the POLA area (see subsection 3.2.15.D, Oceanography and Marine Biology).

The California brown pelican (Pelecanus occidentalis californicus), a federally listed endangered species, is known to breed along the southern California coast, south to islands off the coast of Baja California. Individuals have also been cited along the Colorado River and are thought to be accidentals (Powell, 1985). Poor reproductive success has been attributed to ingestion of pesticides that causes soft-shelled egg formation.

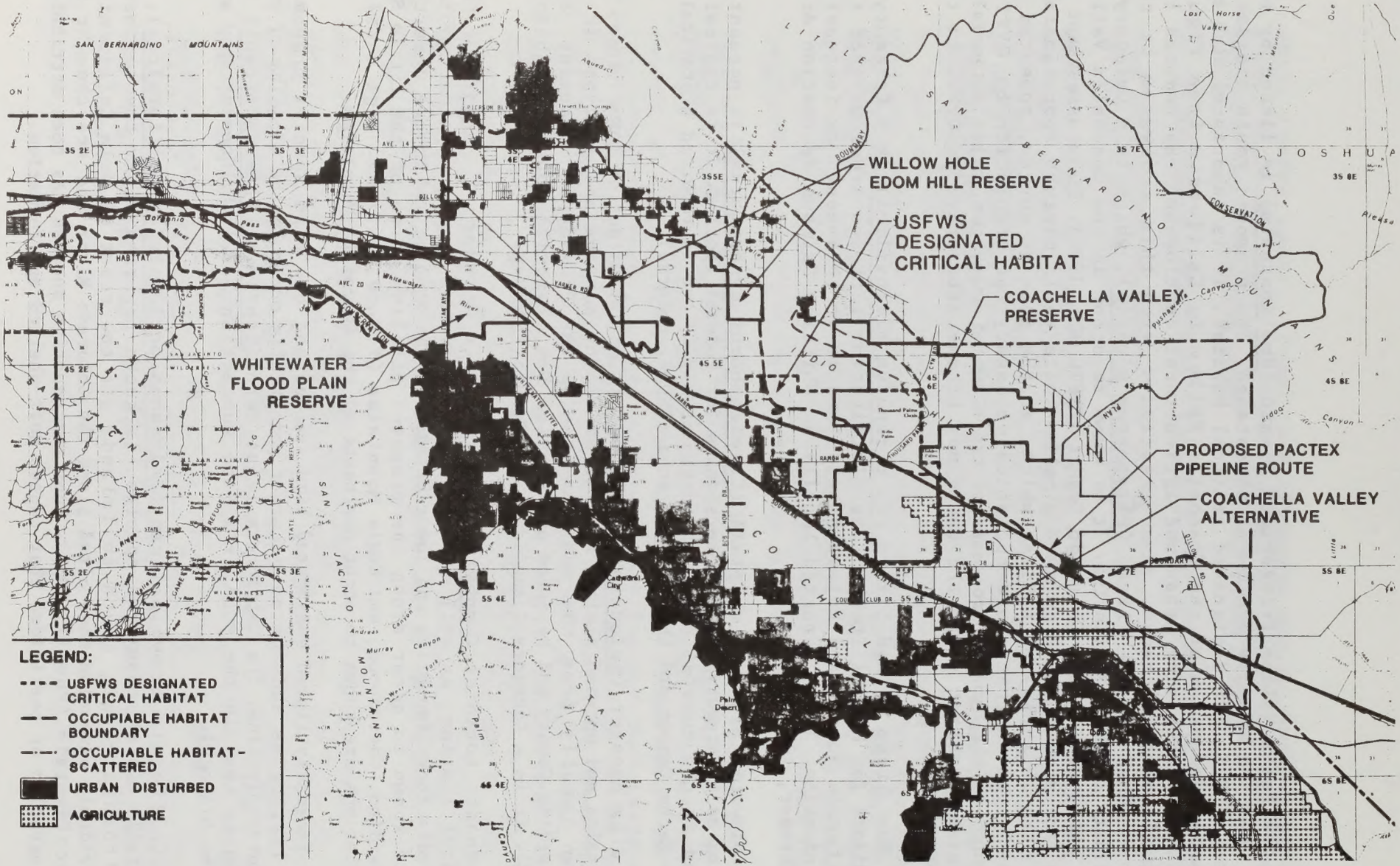


Figure 3.2.7-3 - Coachella Valley Fringe-Toed Lizard Habitat
(CVTL HCP, 1984)

The bald eagle (Haliaeetus leucocephalus) inhabits areas near coasts, rivers, and large bodies of water. This federally listed endangered species occurs in the project area as a migrant, although historical nesting occurred in small canyons adjacent to the California coast. They are permanent residents on Santa Catalina Island. Reservoirs in southern California are important wintering areas for bald eagles. They could occur as accidental migrants or winter visitors anywhere along the proposed route where habitat and prey are adequate. Chances of occurrence are much greater along major rivers that provide important prey and roost trees (primarily large cottonwoods). Bald eagles are known to occur near the Colorado River crossing, as well as in the Cibola and Imperial National Wildlife Refuges but appear to be uncommon along major water courses crossed by the proposed pipeline east of the Colorado River.

The federally listed endangered peregrine falcon (Falco peregrinus) is a raptor of coastlines, mountainous areas, and riparian habitat. Peregrines may potentially occur as migrants along coastal estuaries and the Colordao River. They are also reported from the Cibola and Imperial National Wildlife Refuges. Two peregrine falcon eyries occur in the vicinity of the pipeline near Hot Springs, Arizona. Both eyries are north of the proposed pipeline in the Galiuro Range and Winchester Mountains. Three pairs of peregrines nested recently in the Guadalupe Mountains, Texas, north of the proposed route.

The Yuma clapper rail (Rallus longirostris yumanensis) (Federal status - endangered) breeds primarily in marshes along the Colorado River from the California/Nevada border south to the Colorado Delta. A major nesting population occurs in the Imperial National Wildlife Refuge. The species is also reported near Gillespie Dam on the Gila River.

The least Bell's vireo (Vireo bellii pusillus) was proposed for listing as a Federal endangered species on May 3, 1985. Least Bell's vireos have been reported from the Whittier Narrows Recreation Area (Harvey, 1985), Santa Ana River, and San Timoteo Canyon (CDFG, 1980). Critical habitat was also proposed along the Santa Ana River north of Prado Dam and south of the proposed river crossing. Potential habitat occurs downstream from the Whittier Narrows Dam in the vicinity of the proposed pipeline crossing (Harvey, 1985).

Ten bird species were identified by the U.S. Fish and Wildlife Service as Category 2 candidate species. The fulvous whistling duck (Dendrocygna bicolor) is a very rare inhabitant of marshes and irrigated land along the Colorado River. Swainson's hawk (Buteo swaisoni) prefers open plains, grasslands, or flat terrain but displays only spotty distribution in the CDCA. It is also reported from the Colorado River Valley. The ferruginous hawk (Buteo regalis) is known locally in the Perris-Lakeview area, Riverside County. The western snowy plover (Charadrius alexandrinus nivosus) has suffered from reduced habitat along the coast. The species also nests near the Salton Sea and at scattered interior localities. The tricolored blackbird breeds in extensive reed beds along the coast and interior areas but prefers foraging in agricultural areas or on open lawns. It is only a casual visitor in the project area. The mountain plover

(Charadrius montanus) formerly wintered on coastal plains of Orange County and in the San Fernando Valley, Los Angeles County. The species occurs along the Colorado River, mostly near Blythe, but is uncommon.

The candidate bird species with the greatest potential to be affected by the project are California black rail (Rallus jamaicensis coturniculus), western yellow-billed cuckoo (Coccyzus americanus occidentalis), and the coastal blacktailed gnatcatcher (Polioptila melanura californica). The California black rail (Rallus jamaicensis coturniculus) inhabits marshes above and below Imperial Dam. The least Bell's vireo has been reported from several riparian areas along the course of the pipeline route, including the Whittier Narrows Recreation Area, Santa Ana River near Riverside, and San Timoteo Canyon. The western yellowbilled cuckoo historically nested along rivers and streams from Shasta County to southern California. Recent sightings in the project area include riparian areas along the Santa Ana River, Riverside County, and along the Colorado River from Needles to Laguna. The coastal blacktailed gnatcatcher occurs in sage scrub vegetation and has been reported in the project area at Whittier Narrows (Bontrager, 1984).

Two mammalian species that may occur in the proposed project area and are candidates for Federal listing are Stephen's kangaroo rat (Dipodomys stephensi) and the Yuma puma (Felis concolor browni). Stephen's kangaroo rat is found only the San Jacinto Valley, west Riverside, and south San Bernardino counties, California. Habitat is dry, open, or sparsely bushy areas. Hicks and Copperrider (1976) reported Stephen's kangaroo rat in the badlands area southwest of San Timoteo Canyon. Hall and Kelson (1959) reported the species as occurring in Reche Canyon, 4 miles southeast of Colton. The Yuma puma has been reported near Parker and near the Chocolate Mountains (Powell, 1985).

Desert bighorn sheep occur in several southern California mountain ranges, including the Granite, Santa Rosa, San Jacinto, Orocopia, Chuckwalla, Eagle, Little San Bernardino, Palen, and McCoy Mountains (Figure 3.2.7-2). The bighorn sheep is a federally listed sensitive species. The subspecies Ovis canadensis cremnobates (peninsular bighorn sheep) is found from the San Jacinto and Santa Rosa Mountains south to the Jacumba Mountains in San Diego County. The subspecies is listed by the California Department of Fish and Game as rare (CDFG, 1980). Problems affecting bighorn sheep within the area are enroachment of human habitation onto ranges, lack of sufficient water, and loss of vegetative cover from drought, identified by Weaver and Mensch (1970).

Several species of protected wildlife and important habitats occur along the Colorado River south of the proposed crossing. Cibola and Imperial NWRs occur 20 miles downstream of the proposed pipeline crossing of the Colorado River. Several sensitive species may potentially occur downstream of the Colorado crossing in manmade wetlands habitat, including the black rail, Yuma clapper rail, bald eagle, and osprey (Pandion haliaetus) (Arizona state list). Osprey nest 2 miles below the crossing (BLM, 1984a, p. 3-59).

The Whittier Narrows Dam is located on the San Gabriel River and the Rio Hondo. The flood control reservoir behind the dam serves various purposes, including flood control protection, military and commercial operations, recreational facilities, a nature center, and wildlife areas. The area offers unique open space and wildlife habitat within a highly developed urban environment. Areas designated as natural wildlife habitat occur primarily along the area adjacent to the San Gabriel River channel (Bontrager, 1984). The New Lakes and river sections provide a significant amount of wetland/ riparian wildlife habitat that supports large numbers of resident and migratory bird species. Large open expanses used previously for grazing and agricultural purposes now provide feeding and nesting areas for raptors. A naturalized population of cardinals established in the 1930s can be observed in the area. Some 264 species of birds have been recorded in the area (Los Angeles County Department of Parks and Recreation, 1985). The California black-tailed gnatcatcher, a Category 2 Federal candidate species, is a permanent resident. Least Bell's vireos have also been reported in the area. Twenty-three species of mammals and at least 13 species of amphibians and reptiles are known from the site, including the San Diego horned lizard, a Category 2 Federal candidate species (Bontrager, 1984). Approximately 230 species of plants occur in the area, including willows, sycamores, cottonwoods, mulefat, elderberry, and emory baccharis (Los Angeles County Department of Parks and Recreation, undated).

Sensitive wildlife areas occur along the proposed pipeline route east of the California-Arizona border. Particularly sensitive are desert bighorn sheep migration corridors. Lambing areas and associated watering holes occur in rocky habitats at elevations above the route. North of I-10, the route would come within 2.0 miles of the Lazarus tank lambing grounds. Other species possibly occurring along the route include American peregrine falcon, Yuma mountain lion, desert tortoise, and Gila monster (BLM, 1984a, p. 3-119).

Another sensitive area along the proposed route occurs near the Hot Spring pump station west of Willcox, Arizona. In this vicinity, the proposed route would cross the Muleshoe Ranch, a 51,380-acre land parcel leased by the Arizona Nature Conservancy. The area contains deciduous riparian woodlands, a unique and vanishing community in the southwest. The mature cottonwoods and western sycamore provide nesting habitat for several rare southwestern raptors such as the common black hawk (Buteogallus anthracinus), gray hawk, and zone-tailed hawk. The streams also provide habitat for the Gila chub (see subsection 3.2.6) (BLM, 1984a, 3-60).

Three Federal candidate invertebrate species have been reported from the project area. The Coachella giant sand treader cricket (Macrobanetes valgum) and the Coachella Valley Jerusalem cricket (Stenopelmatus cahuilaensis) both occur in the Coachella Valley of California. Whereas the proposed route avoids known localities of the Coachella Valley Jerusalem cricket, other undocumented populations may occur elsewhere in the Coachella Valley (Weissman, 1985). The New Mexico ram's horn snail (Pecosorbis kansasensis) was recently reported from two localities north of the pipeline route in Eddy County, New Mexico. Species less likely to be affected by the proposed pipeline are described in Table I.1-1.

3.2.8 SOCIOECONOMICS

The study area includes three counties in California, five counties in Arizona, six counties in New Mexico, and six counties in Texas. Information sources for the regional overview include U.S. census data, state employment statistics, community profiles, economic development information, annual state financial reports, and personal telephone interviews. This subsection describes the economic and demographic characteristics of the three counties in California and provides an overview of all other counties in Arizona, New Mexico, and Texas to be traversed by the pipeline. Supporting demographic and economic information on counties that would be affected by the project are given in Tables 3.2.8-1, 3.2.8-2, and 3.2.8-3. Unless indicated otherwise, the data discussed in the following subsections is derived from the sources listed in the tables.

A. California Counties

1. Los Angeles County. Nearly one-third of California's population resides in Los Angeles County - the state's and southern California's most populous county. Only six states other than California have a population larger than Los Angeles County. The city of Los Angeles ranks third in the nation in size of population, behind New York City and Chicago.

The 1980 U.S. population census showed a population in Los Angeles County of 7.477 million. Current estimates place the existing population level at 7.909 million. Total Los Angeles population increased 31% over the 1960-1984 period and is expected to increase by another 0.5 million persons by 1995, providing the largest absolute increase for any county in the state for that period.

The county's economy is dominated by the services section (24.3%), manufacturing (24.1%), and trade (22.8%). Per capita personal income in 1982 was $13,080, versus $12,616 for the state as a whole. The average family income in 1979 was $25,058, which exceeded the U.S. median family income by 6.2%.

Total employment in 1982 reached 3.66 million. Three-fifths of the jobs in southern California are found in Los Angeles County. Only four other states other than California (New York, Ohio, Illinois, and Texas) generate more jobs than Los Angeles County. Unemployment, which reached 9.3% in 1982, declined to 8.0% by the end of 1984 (Security Pacific National Bank, 1984b).

One-third of California's nonresidential development takes place in Los Angeles County, which is also the largest market in California for office development. Over one-third of the state's commercial permit valuations were issued in Los Angeles County (Security Pacific National Bank, 1984b).

2. San Bernardino and Riverside Counties. San Bernardino and Riverside Counties are among the fastest growing counties in the state. Lower land and housing costs are the magnets for continued migration from coastal counties of both people and companies.

Table 3.2.8-1 - Regional Economic Profile: Population and Employment

State/County	Estimated Population 1980[a]	Estimated Population 1984	Average Annual Increase (%)	Employment 1980	Employment 1984	Unemployment Rate (%) 1980	Unemployment Rate (%) 1984	Primary Industries
California								
Los Angeles	7,477,503	7,909,300[b]	1.4	3,624,100[c]	3,664,000[c]	6.6[c]	8.0[c]	Services, trade, government
San Bernardino	895,016	1,032,000	3.6	541,500[d]	623,300	7.6[e]	8.5	Trade, services, manufacture
Riverside	663,166	775,200	4.0	-	268,200	-	7.5	Trade, services, agriculture
Arizona								
Yuma/La Paz	90,554	99,200[f]	2.3	32,625[f]	34,550[f]	11.9[f]	13.0[f]	Trade, government, agriculture services
Maricopa	1,509,052	1,731,100	3.5	708,300	780,900	5.9	3.8	Trade, government, manufacuture, services
Pinal	90,918	98,500	1.7	29,650	28,100	7.4	9.9	Government, mining, trade, agriculture
Pima	531,443	603,300	3.2	211,400	249,100	5.8	4.5	Trade, government, manufacture, services
Cochise	85,686	91,200	1.6	25,575	26,475	8.8	7.0	Trade, government, manufacture, services
New Mexico								
Hidalgo	6,049	6,600[g]	1.8	2,209[h]	2,398[h]	4.6[h]	5.3[h]	Services, trade, mining, agriculture
Grant	26,204	29,100	2.1	8,968	8,989	7.6	11.4	Trade, government, mining
Luna	15,585	16,400	1.0	4,601	4,738	11.6	11.2	Government, trade, agriculture, mining, mfg
Dona Ana	96,340	107,700	2.3	31,587	39,541	8.9	7.7	Government, trade, services, manufacture
Eddy	47,855	53,200	2.1	17,965	21,228	5.8	9.0	Mining, services, trades
Lea	55,993	72,200	5.2	23,570	29,742	2.8	4.4	Oil, services, trades
Texas								
El Paso	479,899	521,317[i]	2.8	164,134[j]	176,580[j]	9.1[j]	11.6[j]	Manufacture, trade, government (military)
Hudspeth	2,728	2,867	1.7	841	1,005	3.7	2.1	Agriculture, government, services
Culberson	3,315	3,310	(0.5)	1,426	1,529	5.4	7.7	Services, trade
Winkler	9,944	10,083	0.5	3,346	3,201	3.0	6.2	Agriculture, oil, government, trade
Ector	115,374	134,718	8.1	56,025	66,193	2.3	5.5	Oil, trade
Midland	82,636	99,684	9.8	41,753	62,826	1.9	4.7	Oil, trade, services

[a]U.S. Bureau of the Census.
[b]California State Department of Finance 1985.
[c]California State Employment Development Department.
[d]This figure represents total employment for both San Bernardino and Riverside Counties.
[e]This figure represents total unemployment for both San Bernardino and Riverside Counties.
[f]Arizona Department of Economic Security 1984.
[g]Estimate: Bureau of Business and Economic Research, University of New Mexico (1985 figures)
[h]New Mexico Employment Security Department 1984.
[i]Estimate: Texas Department of Water Resources 1985.
[j]Texas Employment Commission.

Table 3.2.8-2 - Regional Economic Profile: Income, Sales, and Fiscal Conditions

State/County	1982 Income[a] Personal ($ million)	1982 Income[a] Per Capita ($)	1984 Retail Sales	1984 Assessed Valuation ($ 000)	1984 Property Tax Levy ($ 000)
California					
Los Angeles	100,426	13,080	54,774,487[b]	243,389,882[b]	2,403,430[b]
San Bernardino	9,313	9,711	5,713,100	28,341,459	294,889
Riverside	7,579	10,606	4,611,539	26,425,188	260,147
Arizona					
Yuma/La Paz	733	7,649	320,137[c]	55,823[d]	4,028[d]
Maricopa	17,840	11,086	6,607,012	5,257,522	451,214
Pinal	739	7,729	187,627	305,816	39,294
Pima	5,661	9,969	1,829,318	1,777,879	196,084
Cochise	717	7,969	208,060	259,850	22,067
New Mexico					
Hidalgo	51	7,787	21,675[e]	80,849[f]	1,232[f]
Grant	232	8,042	94,797	245,239	4,677
Luna	123	7,587	63,527	96,407	1,632
Dona Ana	771	7,729	410,953	411,363	9,133
Eddy	515	10,223	233,735	703,425	9,179
Lea	733	12,249	390,618	1,459,414	21,899
Texas					
El Paso	3,958	7,832	2,120,722[g]	8,214,075[h]	18,972[h]
Hudspeth	23	8,186	4,819	170,552	255
Culberson	23	7,230	26,405	314,059	1,038
Winkler	83	16,224	49,414	1,169,593	3,859
Ector	1,665	12,354	993,340	5,797,355	15,073
Midland	1,655	16,592	713,358	5,072,596	7,147

[a]BEA, 1984c
[b]California State Board of Equalization.
[c]Arizona State Department of Revenue (1982 data).
[d]Yuma/La Paz County Treasurer (1983 primary valuation).
[e]New Mexico State Department of Taxation and Revenue, 1984.
[f]New Mexico State Department of Finance and Administration, 1985. New Mexico Local Governments and the Property Tax.
[g]Bureau of Business Research, University of Texas (1982 data).
[h]Texas State Property Tax Board (General Fund).

Table 3.2.8-3 - Regional Economic Profile: Housing and Public Services

State/County (City)	Housing					Public Service		
	1980[a]			1985[b]		1983[c]		1982[d]
	Total Units	Renter Occupied (%)	Vacancy (%)	Hotel/Motel Rooms (No.)	Campsites/ RV Sites (No.)	Full-Service Hospitals	Total Beds	County Law Enforcement Employees
California								
Los Angeles	2,863,453	51	4.3	NA	NA	191	39,000	-
San Bernardino	366,136	32	15.7	1,467	NA	21	3,398	NA
Riverside	291,783	32	16.7	6,000	2,081	14	2,256	NA
Arizona								
Yuma/La Paz	37,501	31	12.3	70	4-5,000	1	220	16[e]
Maricopa	610,782	31	8.6	19,811	6,969	30	6,929	2,315[e]
Pinal	34,080	30	8.0	1,048	1,278	5	210	158
Pima	218,609	34	9.4	7,490	2,540	13	2,665	739[e]
Cochise	32,564	34	10.3	374	66	6	257	108
New Mexico								
Hidalgo	2,326	42	17.7	300	70	0	0	NA
Grant	9,361	28	10.0	570	NA	2	370	35
Luna (Deming)	6,290	26	11.0	1,463	394	1	48	30
Dona Ana (Las Cruces)	33,584	36	9.5	336	NA	1	177	96
Eddy (Carlsbad)	18,154	28	7.5	1,230	85	2	175	-
Lea (Hobbs)	21,083	28	9.8	850	60	2	148	-
Texas								
El Paso	147,766	41	4.7	5,624	534	14	2,367	831
Hudspeth	1,059	41	22.3	18	2	0	0	10
Culberson	1,123	35	12.1	500	17	0	0	11
Winkler	3,802	24	10.2	120	12	1	61	12
Ector (Odessa)	42,607	33	5.1	1,250	-	2	429	-
Midland (Midland)	31,337	29	5.4	1,050	400	2	234	-

NA = not available:
[a]U.S. Bureau of the Census 1980.
[b]Chambers of Commerce, Economic Development Departments, Tourist Bureaus, Visitor Conference Centers, Personal Interviews.
[c]American Hospital Association, 1983.
[d]FBI 1982, Uniform Crime Reports.
[e]City figures.

San Bernardino County, over 20,000 mi^2 in area, is geographically the largest county in the nation. Over 90% of the county is desert and consists of mountains, valleys, and dry lake beds. The San Bernardino Mountains occupy the southwestern part of the county. Most of the county's population and much of San Bernardino's agricultural production is concentrated behind the valleys and foothills of these mountains, which separate the area from the desert region.

The county of Riverside encompasses an area of approximately 7,300 mi^2. The western portion of the county is separated from the rest of the area by a series of mountain ranges that include the San Jacinto and Santa Ana mountain ranges. This part of the county contains almost all the population and commercial/industrial activity. The eastern part of the county consists of a series of sparsely settled desert ranges and basins, which include one region of growing population and commercial agricultural activity in the Palm Springs and adjacent Coachella Valley.

Population in San Bernardino County numbered 1,032,000 in 1984. Since 1980, the county has averaged a growth rate of 3.6%. By 1995, the county is expected to show a further growth of 34%, bringing the total population to 1.4 million (Kiplinger, 1984). Riverside County's 1984 population of 775,200 reflects an annual increase of 4.0% since 1980. County population by 1995 is projected to increase another 36% to 1,050,400. Only the counties of Los Angeles, Orange, San Diego, and San Bernardino will evidence a greater absolute increase in population by 1995 (Kiplinger, 1984). The pipeline is proposed to basically run the length of Riverside County. The pipeline would pass through the cities of Beaumont, Banning, Indio, and Blythe. The most recent population figures for these cities show 7,750 for Beaumont, 15,350 for Banning, 25,450 for Indio, and 7,150 for Blythe. Of all cities in the county, Blythe (the most populous city in the extreme eastern part of the county) has had one of the lowest absolute increases in population since 1980.

In 1980, the native American Population for the four Indian communities within the vicinity of the pipeline route (all in Riverside County) totaled 8,200. These communities are identified below.

Community	Proximity to ROW
Morongo Indian Reservation (north of Banning)	Traversed by pipeline
Agua Caliente Indian Reservation (northeast of Palm Springs)	Traversed by pipeline
Torres Martinez (south and east of Coachella)	6 miles
Cabezon (northeast of Coachella)	1 mile

Both San Bernardino and Riverside Counties experienced adverse effects of the recession. The bicounty labor market lost over 5,100 jobs in 1982. Agriculture continues to provide an important mainstay in the Riverside and San Bernardino economies, but recent growth has centered in the services and trade industries, which indicates the importance of tourism in the region. Other important industries in the area include the government and manufacturing sections.

In 1984, the unemployment rate for Riverside County was 7.5%, while that for San Bernardino County was 8.5%. This compares to a weighted average for the two counties of 7.6% in 1980. Services is the only industrial division in the area to post substantial employment gains over the past few years. Per capita incomes in San Bernardino and Riverside Counties in 1984 were $9,711 and $10,606, respectively, compared to $12,616 for the state as a whole.

The 1980 housing stock was 366,136 total units in San Bernardino County and 291,783 total units in Riverside County. The average household sizes were 2.8 and 2.7 persons, respectively. The average vacancy rate was 15.7% for San Bernardino County and 16.7% for Riverside County.

Overnight accommodations along the proposed route between Indio and Blythe are minimal. Indio has an estimated 1,200 rooms; Blythe has a total of 488 rooms. Campsites along the route are also sparse.

B. Arizona, New Mexico, and Texas Counties

1. Arizona. The following discussion provides a baseline overview of demographic and economic characteristics of the five Arizona counties (Yuma/La Paz, Maricopa, Pinal, Pima, and Cochise) along the proposed pipeline route.

Population in the five-county area totaled 2,623,300 in 1984. The greatest concentration of population occurs in Maricopa and Pima Counties, specifically the Phoenix and Tucson metropolitan areas. In 1980, the native American population for the six Indian communities within the vicinity of the pipeline route totaled 30,105. These communities are identified below (BLM, 1984a, p. 3-65):

Community	Proximity to ROW
Colorado Indian Reservation (north of Ehrenberg, AZ)	3 miles
Maricopa Indian Reservation (northwest of Casa Grande, AZ)	1 mile
Gila Indian Reservation (northwest of Coolidge, AZ)	4 miles
Papago Indian Reservation (south of Casa Grande, AZ)	13 miles
San Carlos Indian Reservation (east of Globe, AZ)	16 miles
Gila Bend Indian Reservation (north of Gila Bend, AZ)	18 miles

Manufacturing is one of the primary industries in Maricopa and Pima Counties, in addition to the government, trade, and services sectors, which are major employers throughout the five-county study area. Maricopa, Pinal, Pima, and Cochise Counties share tourism as one of their primary industries. Mining is a significant contributor to the economy of Pinal County. Agriculture remains an important industry in Yuma County (BLM, 1984a, p. 3-66).

Yuma/La Paz and Pinal Counties evidenced the highest unemployment rates in 1984 at 13.0% and 9.9%, respectively. The comparable rate for 1983 was above 18% for each county. The strong economic recovery in the Phoenix and Tuscon areas reduced unemployment to very respectable levels in 1984. Maricopa County recorded a 3.8% unemployment rate, while Pima County showed a somewhat

higher rate of 4.5%. In 1980, unemployment within the Indian communities ranged between 18% in the Salt River Pima-Maricopa community to 43% in the San Carlos Apache Tribe (BLM, 1984a, p. 3-66).

In 1980, a total of 933,536 total housing units was counted for the five-county Arizona study area. Yuma/La Paz County showed the highest county vacancy rate at 12.3%; Pinal County showed the lowest rate at 8.0%.

Personal income in the five-county region is based largely on the sectors that provide the greatest share of employment: trade, services, and government. In 1982, total personal income in the five-county region was $25.7 billion. The per capita income in the region varies significantly among counties. The more populated areas show higher incomes that correspond with the higher costs of living.

Along the proposed pipeline route between Blythe, California, and Gila Bend (156 miles), temporary overnight accommodations are scarce. From Gila Bend to the New Mexico border, available data indicates that sufficient lodging is available. Estimated overnight rooms in the five-county area within commuting distance of the proposed pipeline total 38,793. Campsites in the same area total 15,810.

All public services and facilities are adequately provided to the existing population (BLM, 1984a, p. 3-66).

2. New Mexico. The following narrative provides a baseline overview of demographic and economic characteristics of the six New Mexico counties (Hidalgo, Grant, Dona Ana, Luna, Eddy, and Lea) that the proposed pipeline would traverse. Estimated population in the six-county area in 1984 was 285,200.

The government sector is considered primary to all six counties; it is the largest employer in Dona Ana County (White Sands Space and Missile Research Center and New Mexico State University at Las Cruces) and the second largest employer in both Hidalgo and Luna Counties. The services and trade industries reflect the importance of tourism as an important source of economic stability in the six counties. Agriculture (primarily ranching and irrigated farming) and mining are also important economic sectors in Grant, Hidalgo, and Luna Counties (BLM, 1984a, p. 3-67). Luna and Dona Ana Counties are experiencing increased manufacturing activity. Mining and oil represent the primary economic sectors in Eddy and Lea Counties.

Unemployment remains high in Grant, Luna, and Eddy Counties. Grant County is especially vulnerable to shifts in employment rate because of the fluctuations in copper mining activity. Unemployment in other three counties ranged from 4.4% to 7.7% in 1984.

Personal income in the six-county region is based largely on the sectors that provide the greatest share of employment: government, trade, services, and mining. In 1982, total personal income in the area was $2.4 billion. Per capita incomes in 1984 were highest in Eddy and Lea Counties, the counties with the largest urban populations.

Housing units in the six-county area totaled 88,571 in 1980. Vacancy rates were high in all counties, ranging from 7.5% in Eddy County to 17.7% in Hidalgo County. Renter-occupied units showed especially high vacanies in the 1980 census.

Temporary overnight accommodations are sparse between the Arizona border and Las Cruces. Lordsburg, Deming, and Las Cruces have a large number of motel/hotel rooms but are the only major population centers for a distance of 130 miles. Overnight rooms in the study area total 4,749 and campsites total 610.

The Las Cruces water system is operating at 95% capacity. Expansion of the system is in the planning stages. All other public services are adequate for existing populations (BLM, 1984a, P. 3-67).

3. Texas. The following narrative provides a baseline overview on demographic and economic characteristic of the six Texas counties traversed by the proposed pipeline. Estimated 1984 population in the six-county area totaled 771,975.

In many counties, trade or services and government are major areas of employment. Government generally employs between 15% to 25% of the total work force (BLM, 1984a, p. 3-67).

In Winkler, Culberson, and Midland Counties, mining (oil and gas production) employs 20% to 30% of the work force. Manufacturing is an important employment sector in the more populated county of El Paso (23%). Agriculture, consisting mainly of ranching and irrigated farming, is strong in Hudspeth County. Ector County has a diversified economic base with an emphasis on industrial manufacturing business related to oil and gas production and service.

Personal income in the six-county region is based largely on the sectors that provide the greatest share of employment, i.e., trade, services, government, and mining (oil and gas production). In 1982, total personal income for the region was $7.4 billion (U.S. Department of Commerce, BEA, 1984).

Housing units in the area totaled 227,694 in 1980. Vacancy rates ranged from a low of 4.7% in El Paso to a high of 22.3% in Hudspeth County. Areawide housing vacancies appeared high in the sparsely populated counties.

3.2.9 LAND USE AND RECREATION

The following subsections focus on existing land ownership and land-use patterns, special-use and recreational areas, and land-use regulations and policies that may be affected by the proposed pipeline.

A. California

1. Land Use and Ownership. Land ownership for the California segment of the pipeline is 25% Federal, 24% state and local governments, and 51% private use. Approximately 54% of the line crosses open-space, 22% agricultural, and 24% developed land. The approximate percentages of each land use adjacent to or traversed by the proposed pipeline is presented by county in Table 3.2.9-1.

Table 3.2.9-1 - POLA to Blythe: Land-Use Analysis by County for Pipeline Route

County	Total Miles in County	Open Space		Agriculture		Developed	
		%	miles	%	miles	%	miles
Los Angeles	36	61	22	8	3	31	11
San Bernardino	42	12	5	36	15	52	22
Riverside	150	64	96	21	32	15	22
Total miles	228		123		50		55
%	100		54		22		24

Source: ES, 1985.

In Los Angeles County, the proposed pipeline route would cross 61% open space (including river and flood control channels), 8% agriculture, and 31% developed lands. Land use in Los Angeles County is primarily developed. Extensive development, including residential, commercial, and industrial areas, is usually found on either side of the channelized waterways. Little agricultural land is encountered along the proposed route in Los Angeles County.

The predominant use of POLA land is that associated with a large industrial harbor. Land and waterways have been developed to accommodate a variety of cargo types and vessel traffic. A proportion of land within the port has been developed as recreational and commercial areas.

From POLA, the proposed route would follow the Dominguez Channel and the Los Angeles River and Rio Hondo ROWs. Land use on either side of the proposed pipeline route is extensively residential with tracks of industrial and commercial developments. Agricultural lands are found along the San Jose Creek and railroad ROWs in the vicinity of the flood control basin and Pomona. The remainder of the route in Los Angeles County would traverse developed land.

In San Bernardino County, current land use crossed by the proposed pipeline route is 12% open space, 36% agriculture, and 52% developed. Large tracts of agricultural land would be crossed along the pipeline ROW east of Crestmore and at San Timoteo Canyon near Redlands. Developed land would be traversed by the pipeline route in established urban centers, including the cities of Chino, Ontario, Fontana, Rialto, Colton, San Bernardino, Redlands, and the urban areas of Crestmore, Loma Linda, and Bryn Mawr.

In Riverside County, land use along the proposed pipeline route is primarily classified as open space. Agricultural use is limited to interspersed parcels in valley portions of the county. More extensive agricultural lands are encountered in the Blythe area along the Colorado River. The pipeline would follow existing pipeline corridors and railroad/highway ROWs across extensive desert landscape; few developed urban centers would be encountered.

2. Special-Use Areas. Various special-use designated lands lie in the vicinity of the proposed pipeline corridor. There are two designated least tern nesting sites on Terminal Island in POLA (Figure 3.2.9-1). The nesting sites are located <0.5 mile from the proposed pipeline route.

The flood control channels of the Los Angeles River, Rio Hondo, and San Jose Creek (along with the Whittier Narrows Flood Control Reservoir) also comprise specialized use areas. In San Bernardino County, the proposed route is within 0.25 mile of the California Institute for Men in Chino. The Joshua Tree National Monument, primarily reserved for its vegetation and wildlife, lies within 800 ft of the proposed pipeline alignment at its closest proximity. Portions of two Indian Reservations would be traversed by the proposed project. These are the Morongo and Agua Caliente reservations in the vicinity of Banning, Palm Springs, and Thousand Palms.

From Palm Springs to the Colorado River, the proposed route would traverse the CDCA. Recognized by Congress as an area with unique and valuable resources, the CDCA was established under Section 601 of the Federal Land Policy and Management Act of 1976 (FLPMA). Under the provisions of FLPMA, BLM was directed to prepare a comprehensive land-use management plan for the designated area. Included in the California Desert Conservation Plan was an energy production and utility corridor element that defines utility ROWs through the desert. The Pactex pipeline would follow a BLM-identified utility corridor (BLM, 1980).

The proposed route would cross the CVFTL HCP area for approximately 27 miles. The HCP was established to provide a comprehensive plan that would protect the Coachella Valley fringe-toed lizard, a federally listed threatened species, and to establish the conditions under which local governments in the

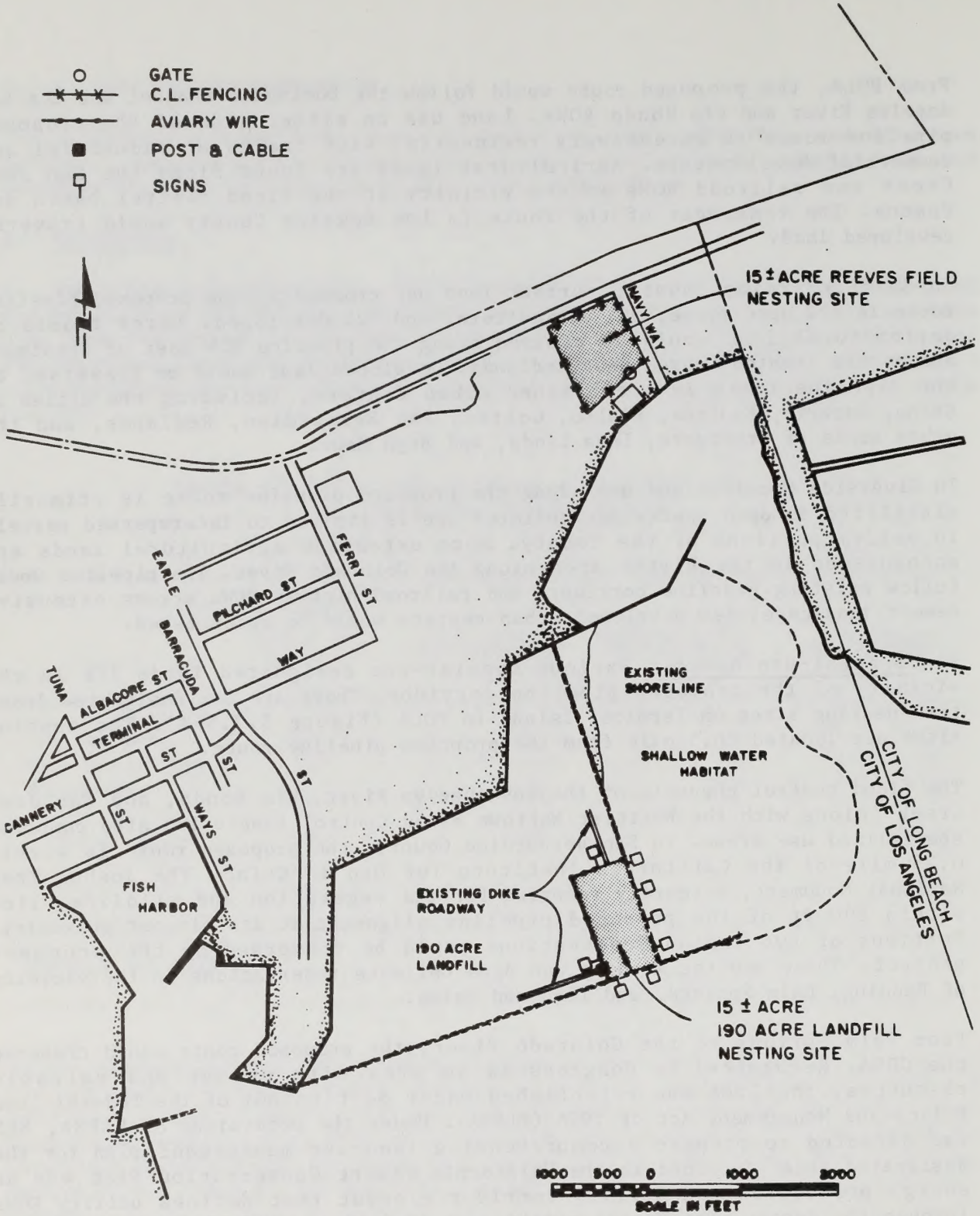


Figure 3.2.9-1 - Designated Least Tern Nesting Sites for 1985 Season (POLA, 1985)

Coachella Valley could exercise traditional land-use controls in compliance with the Endangered Species Act (CVFTL HCP, 1984, p. I-1).

3. Recreational Areas. Within the Greater Los Angeles urban area are numerous developed and undeveloped recreational facilities supporting a wide variety of recreational activities. Recreation localities include local parks and community recreation centers, amusement parks, stables and equestrian trails, bike paths, and golf courses. Recreational areas would generally be located in communities adjacent to the proposed pipeline corridor and not directly traversed by the proposed route.

POLA, while largely an industrialized harbor, affords recreational opportunities to the public in many different areas. The recreational activities that are available in the port include boating, diving, sunbathing, walking, bicycling, fishing, ecological studies, waterskiing, and sailing. Also available are tour boats, sport fishing and diving charters, commercial cruises, and tourist-related activites such as sightseeing, dining, and shopping.

The Dominguez Channel, Los Angeles River, Rio Hondo, and San Jose Creek Flood Control Channels provide opportunities for bicycle and equestrian riding, while the Whittier Narrows Recreational area is designed for the enjoyment of numerous outdoor recreational activities. POLA, the flood control channels, and the Whittier Narrows Recreation area lie along the proposed pipeline route.

The proposed pipeline route through San Bernardino County would largely follow railroad ROWs and utility corridors. San Timoteo Canyon, located approximately 3 miles south of I-10 at Redlands, is a valuable open-space area for outdoor recreational enjoyment. Hiking and equestrian trails along with fishing lakes and camping sites are available within the canyon. The proposed pipeline corridor through the San Timoteo Canyon largely follows the Southern Pacific Railroad.

From San Gorgonio Pass to the Colorado River, the proposed pipeline corridor would traverse the California Desert. Except for largely private lands in the Coachella Valley and Palo Verde Valley, as well as the National Park Service lands of Joshua Tree National Monument, most of this desert area is public domain administered by the BLM. The California Desert attracts millions of visitors annually to its wide spectrum of recreational opportunities. The diversity of recreational use of these lands ranges from recreational vehicles to backpacking and from picnicking and sightseeing, rockhounding, and nature studies.

Two high-use recreational areas along this segment of the pipeline are Joshua Tree National Monument (known for its unspoiled desert landscape and environments,) and Palm Springs and nearby resort communities (popular second-home and retirement communities for Metropolitan Los Angeles residents). At the California/Arizona border, the pipeline would cross the Colorado River, a major water-based recreation resource for the surrounding arid deserts in California and Arizona. Boating, waterskiing, swimming, fishing, and river-floating are a few of the recreational activities available.

Land use for the Arizona, New Mexico, and Texas segments of the pipeline is shown in Table 3.2.9-2. Most of this portion of the route would be the same as that proposed and analyzed for the SOHIO Project (BLM, 1976, pp. 2-746 to 2-754) and for the Celeron/All-American Pipeline Project (BLM, 1984a, pp. 3-82 to 3-85). In general, this route would be immediately adjacent to the El Paso Natural Gas Line, which crosses the entire states of Arizona, New Mexico, and parts of Texas. The proposed transmission lines for the pump stations would generally occur adjacent to or in the vicinity of the proposed pipeline corridor or existing transmission lines.

B. Arizona

1. Land Use and Ownership. Land ownership for Arizona is 34% Federal land, 32% state and local governments, and 34% private. The predominant use of Arizona land along the proposed pipeline corridor is open space (90%). Scattered agricultural areas comprise 9% of the land traversed, while developed areas account for the remaining 1% of the total land crossed in the state.

At the Colorado River crossing in La Paz County, the route would pass through irrigated cropland for 0.2 mile adjacent to a residential development. For the next 63 miles, the route would deviate from the El Paso gas pipeline and would follow Highway 95 and Highway 10. The pipeline would leave Highway 10 in a southeasterly direction west of Upper Bouse Wash until it would again parallel the existing pipeline ROW at Centennial Wash. Eastward from the Colorado River, the proposed pipeline corridor is mostly open grazing land. Development along this section of the pipeline route is limited. The greatest percentage of agricultural land along this section occurs in Maricopa County where 7.6 miles of cropland are found in the existing pipeline ROW.

Pinal County has the longest stretch of cultivated agricultural land along the proposed pipeline route. The heaviest concentration of agricultural land use is in the middle of the county west of Casa Grande. Extending east of the Casa Grande Compressor Station, the land is a patchwork of open range and cultivated lands with scattered pockets of urban use. From the Florence Casa Grande Canal, open space, multiple-use, and grazing lands are the predominant use.

Pima and Cochise Counties are generally open space and grazing lands, except for some scattered irrigated and developed land east of Redington. Agricultural lands can be found along the route north of Wilcox and again south of Bowie near Olga. This is the last agricultural or urban land use encountered in the remaining Arizona section.

2. Special-Use Areas. The proposed pipeline route would not directly interfere with any Federal or state reserve, but some sections would lie within some of the managed public lands. Special features within the corridor and their proximity to the pipeline route are shown in Figure 3.2.9-2. South of the proposed route is the Kofa National Wildlife Refuge established in 1939 for the protection of desert bighorn sheep (Ovis canadensis mexicana) and their environment. Three areas under consideration as a wilderness state

Table 3.2.9-2 - Blythe to Midland: Land-Use Analysis by State and County for Pipeline Route

County	Total Miles in County	Open Space		Agriculture		Developed		Other	
		%	miles	%	miles	%	miles	%	Miles
Arizona									
La Paz	72	98.8	71.1	0.3	0.2	1.0	0.7	0.0	0.0
Maricopa	81	88.3	71.3	10.0	8.1	1.6	1.3	0.0	0.0
Pinal	106	75.4	79.9	22.9	24.3	1.7	1.8	0.0	0.0
Pima	10	100.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0
Cochise	88	87.5	77.0	12.5	11.0	0.0	0.0	0.0	0.0
Miles	357		309.5		43.6		3.8		0.0
%	100		87		12		1		0.0
New Mexico									
Hidalgo	34	71.9	24.4	1.3	0.4	6.2	2.1	20.6	7.0
Grant	18	100.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0
Luna	60	75.7	45.4	14.9	8.9	3.8	2.3	5.6	3.4
Dona Ana	42	85.7	36.0	11.6	4.9	2.7	1.1	0.0	0.0
Eddy	32	93.9	30.0	5.0	1.6	0.9	0.3	0.2	0.1
Lea	40	97.9	39.2	0.0	0.0	2.1	0.8	0.0	0.0
Miles	226		193.0		15.8		6.6		10.5
%	100		85		7		3		5
Texas									
El Paso	42	88.5	37.2	2.8	1.2	7.6	3.2	1.1	0.5
Hudspeth	62	99.6	61.8	0.0	0.0	0.4	0.2	0.0	0.0
Culberson	52	97.8	50.9	0.0	0.0	2.2	1.1	0.0	0.0
Winkler	16	99.8	15.9	0.0	0.0	0.2	0.1	0.0	0.0
Ector	32	99.7	31.9	0.0	0.0	0.3	0.1	0.0	0.0
Midland	16	36.0	5.8	54.5	8.8	8.2	1.3	1.3	0.2
Miles	220		203.5		10.0		6.0		0.7
%	100		93		4		3		*

* = negligible
Source: ES, 1985.

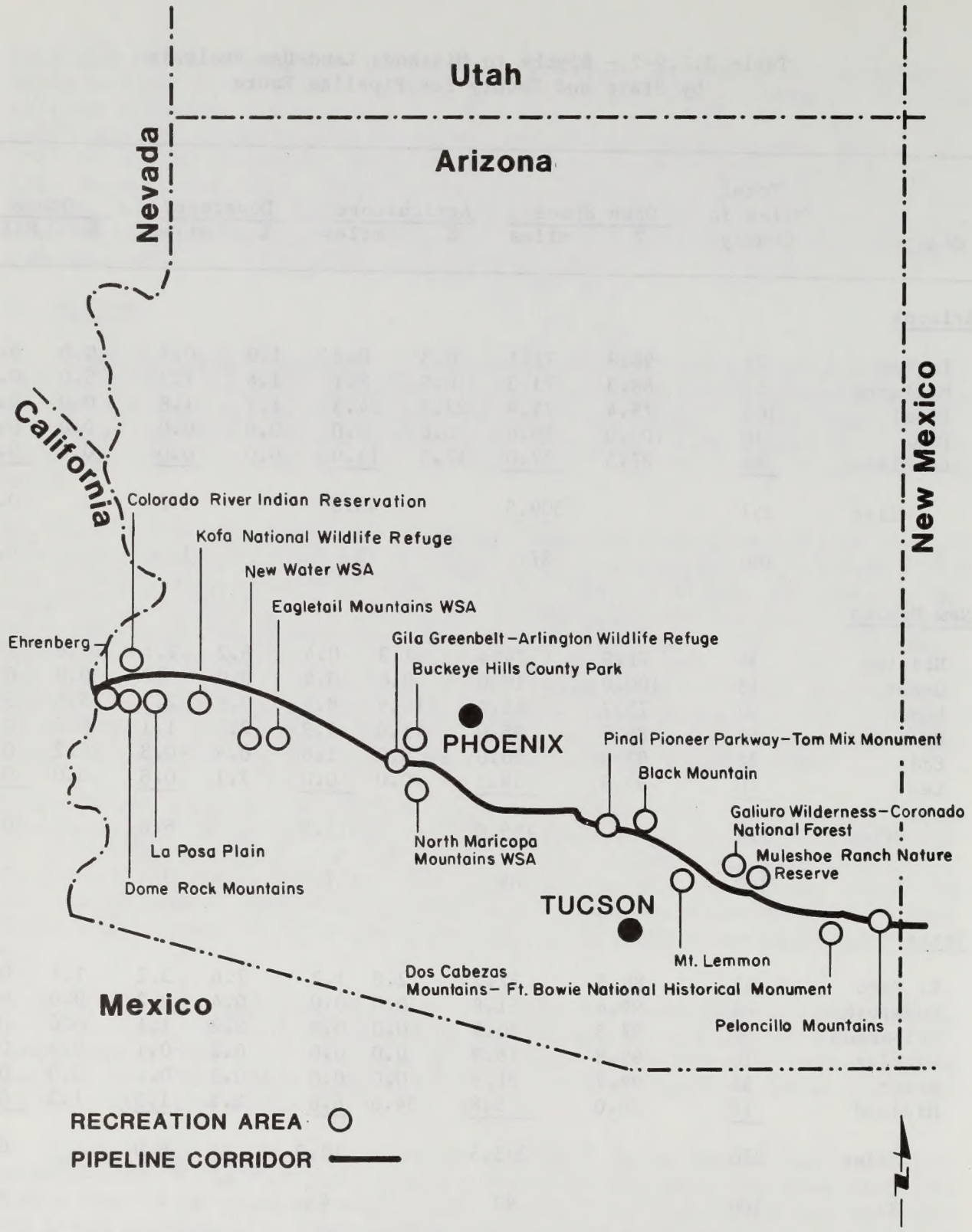


Figure 3.2.9-2 - Arizona: Special-Use and Recreational Areas (ES, 1985)

lie within the vicinity of the pipeline route: The New Water Mountains (2-125), the Eagletail Mountains (2-128), and the North Maricopa Mountains (2-157).

In Maricopa County, the proposed route would pass within 0.5 mile of the southern boundary of the Arlington Wildlife Refuge, which lies along the Gila River above Gillespie Dam. The pipeline crossing at the Gila River would pass through the Fred J. Weiler Greenbelt area. Just over the Maricopa-Pinal County line, the route would run south of the Maricopa Indian Reservation, the Gila River Indian Reservation, and the Akchin Indian Reservation. Further east and north of Coolidge is the Casa Grande National Monument, 5.5 miles north of the pipeline. In the vicinity of the Oracle compressor station, a portion of Coronado National Forest is 1 mile south of the route.

On entering Pima County, the pipeline would parallel the northeast boundary of Coronado National Forest. Again in Cochise County, the line would traverse the Winchester Mountain District of Coronado National Forest for a distance of approximately 10 miles. The Muleshoe Ranch Nature Preserve, located in the Coronado National Forest, would also be crossed by the pipeline. The affected biological environment of the preserve is discussed in subsections 3.2.6 and 3.2.7. About 10 miles south of Bowie is the Fort Bowie National Historic Site; several miles further south of this site is the Chiricahua National Monument.

3. Recreational Areas. The proposed pipeline would not directly interfere with any public or private recreation facility, although several areas would lie within 1 mile of the existing pipeline or would be traversed by it. Figure 3.2.9-2 shows general map locations of significant recreational areas.

The Colorado River crossing receives considerable recreation use from boaters, fishermen, and water skiers. Several boat ramps and recreational facilities are in the Blythe area. The Arizona side has no nearby recreational facilities. Fishing for catfish and bass are popular activities. Beginning in April when water and air temperatures rise, increasing numbers of water skiers and boaters use the river. Holidays and weekends are particularly busy during the spring and summer. Boating craft range from inner tubes to jet boats.

The Kofa National Wildlife Refuge, established to protect desert bighorn sheep habitat, lies south of the proposed pipeline corridor. The area possesses high scenic wilderness and historic values (mining). It is a popular rockhounding and desert flora photography area. The Crystal Hills Campground within the game range is used primarly during the winter months. The route is on the northern border of three BLM WSAs (see Appendix D for a description of these areas). West of Willcox, the pipeline would cross the Muleshoe Nature Preserve managed by the Arizona Nature Conservancy. The Arlington State Wildlife Area and the Gila River Wildlife Area are popular hunting and bird watching areas.

The proposed pipeline would cross foothills of the Winchester Mountains of the Coronado National Forest. Because no public road accesses this block of national forest, the area receives little public recreational use other than

hunting. The pipeline corridor would be 6 to 10 miles or more from the Mt. Lemmon recreation area (skiing and camping) in the Santa Catalina Mountains of the Coronado National Forest, and it would be 8 to 10 miles or more from the Galiuro Mountains Wilderness Area of the Coronado National Forest.

C. New Mexico

1. Land Use and Ownership. The New Mexico segment land ownership is 61% Federal, 25% state and local, and 14% private. The percentage breakdowns of land-use classifications are shown in Table 3.2.9-2 for New Mexico counties. Grazing land forms 87.5% of the land uses along the pipeline route in New Mexico. There is little cultivation; in fact, only 5.5% of the land is classified for agricultural use. Except for California, the greatest percentage of development land is found in New Mexico, primarily in the Lordsburg and Deming areas.

From the Arizona border, the route would pass through desert grassland and alkali flats to within 1 mile of the town of Lordsburg, adjacent to commercial development and the town's airport. It would generally parallel I-10 and the Southern Pacific Railroad main line near the existing natural gas pipeline corridor. Grazing is an important use of public lands in this area. In Luna County, the route would pass through irrigated agriculture and scattered rural subdivisions to the south of Deming. East of the Deming Compressor Station about 2 miles away is a small air strip. The Deming Municipal Airport is north of the pipeline in the southeastern edge of town. The first 36 miles of pipeline in Dona Ana County would follow a route of strictly open grazing. A 5-mile stretch along the Rio Grande margins the riverbank with agriculture. About 10 miles east of the Rio Grande is the Texas-New Mexico border.

2. Special-Use Areas. The proposed pipeline corridor would not traverse any designated special-use area in New Mexico; however, the pipeline corridor would pass close to several park and recreational use areas. Figure 3.2.9-3 shows the general map locations of significant special-use and recreational areas. The pipeline route would pass close to Lordsburg, New Mexico, and would cross the road that leads from Lordsburg to the ghost towns of Shakespeare and Aberdeen, south of Lordsburg. Also, a portion of the Gila National Forest lies nearly 7 miles north of the line at a point east of Lordsburg. South of Deming, in Luna County, the line would cross the access route between I-10, U.S. 70 and 80, and Rockhound State Park. No other recreation area or facility is apparent within the 10-mile area on either side of the pipeline in New Mexico.

3. Recreational Areas. The proposed pipeline corridor would not traverse any designated recreation area in New Mexico; however, the pipeline corridor would pass close to several park and recreational use areas. In New Mexico, the pipeline route would pass close to Lordsburg and would cross the road that leads from Lordsburg to the ghost towns of Shakespear and Aberdeen, south of Lordsburg. Also, a portion of the Gila National Forest lies nearly 7 miles north of the line at a point east of Lordsburg. In Luna County, south of Deming, the line would cross the access route between I-10, U.S. 70 and 80, and Rockhound State Park. BLM's Red Bluff Recreation Site is located



Figure 3.2.9-3 - New Mexico: Special-Use and Recreational Areas (ES, 1985)

4 miles south of the proposed Pecos River crossing. No other recreation area or facility is apparent within the 10-mile area either side of the pipeline in New Mexico.

D. Texas

1. Land Use and Ownership. Land ownership along the Texas segment is almost exclusively private (97%). A small track of Federal land is crossed comprising only 3% of the land traversed in Texas. Land use by Texas counties is listed in Table 3.2.9-2. Approximately 1 mile of cultivated land north of El Paso would be crossed by the existing pipeline before traversing about 7 miles north of Fort Bliss Military Reservation. On leaving the county, the pipeline lies adjacent to Hueco Tanks State Park and continues into Hudspeth County, Texas. Open range makes up 99.6% of the total land crossed in Hudspeth. In Culberson County, the pipeline route would run approximately 2 miles south of the Guadalupe Mountains National Park boundary. The terrain across the county is flat, open grazing land. All of this land is owned privately and makes up 98% of the land in Culberson County.

The proposed pipeline would reenter Texas in Winkler County where 99.7% is open land. The adjacent Ector County is spotted with oil fields in an otherwise monotonous landscape of open range. Nearing the terminal in Midland County, cultivated and developed areas would be encountered.

2. Special-Use Areas. As the pipeline would move eastward from New Mexico into Texas, it would stretch across the northern edge of the Franklin Mountains Wilderness Area. In El Paso County, Fort Bliss Military Reservation lies northeast of El Paso. Fort Bliss Army Base would be crossed by the pipeline, and it has environmental regulations and designated historical areas. Pipeline proponents would need to comply with these requirements prior to ROW issuance. Before leaving the county, the pipeline would pass within several hundred feet of the southwest corner of the Hueco Tanks State Park and would cross the access road from U.S. 180-62 to the park.

In Hudspeth and Culberson Counties, the pipeline would traverse approximately 2 miles south of the Guadalupe Mountains National Park boundary. No other Federal or state reserve is noted along the rest of the route to Midland.

3. Recreational Use. Special-use and recreational areas in the vicinity of the proposed pipeline are shown in Figure 3.2.9-4. Hueco Tanks State Park is adjacent to the proposed route in Texas. Guadalupe Mountains National Park at its closest border is 1.5 miles from the route. Franklin Mountain Wilderness Park is within 2 miles of the ROW. The remainder of the route through Texas is mostly private land with limited recreational activity.

E. Land-Use Planning

County regulations and plans that typically affect pipeline construction include zoning and flood plan ordinances, comprehensive and land-use plans and, in some cases, specific development plans (SDP) for subdivisions. All counties, cities, and states require permits for crossing roads under their

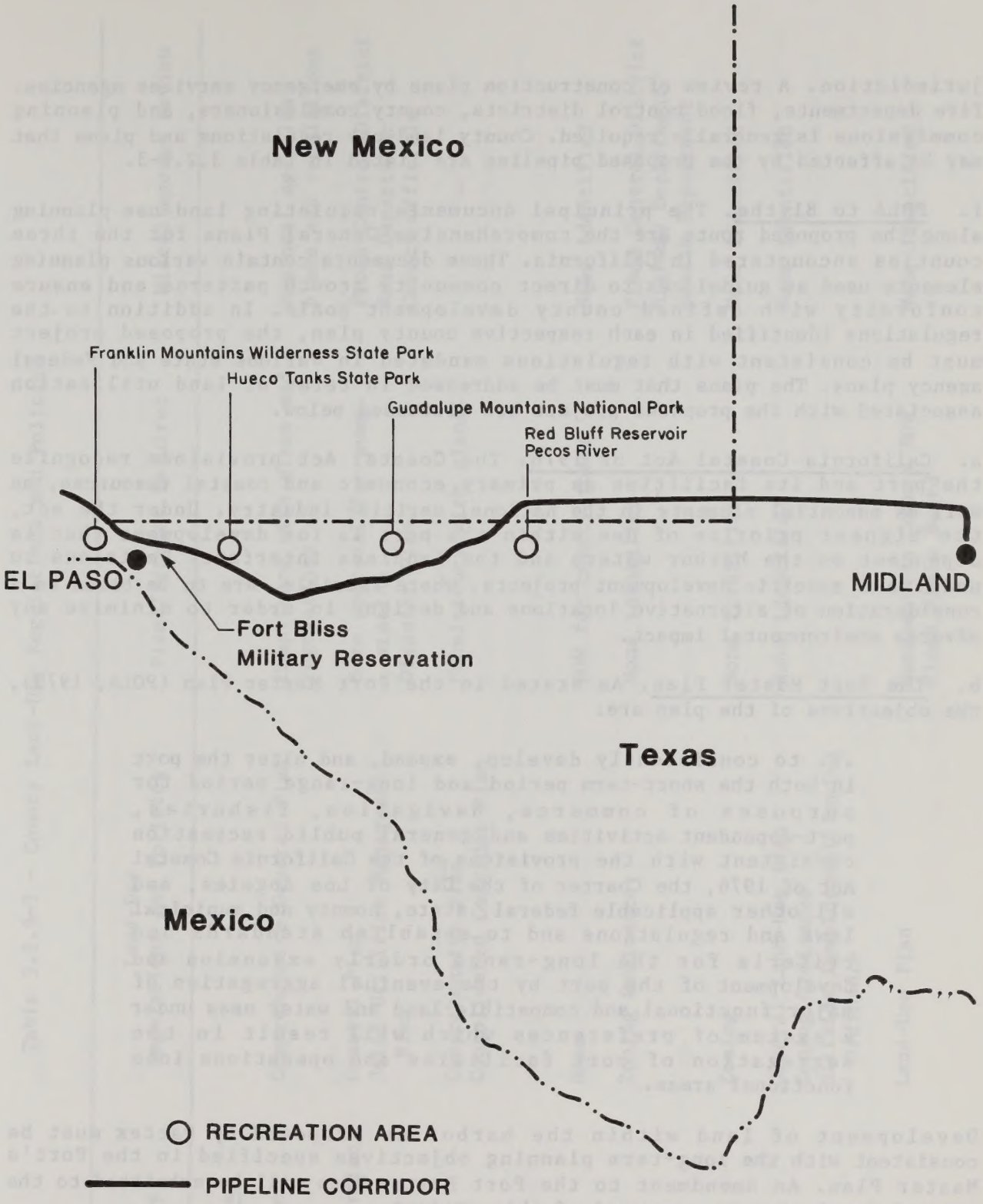


Figure 3.2.9-4 - Texas: Special-Use and Recreational Areas (ES, 1985)

jurisdiction. A review of construction plans by emergency services agencies, fire departments, flood control districts, county commissioners, and planning commissions is generally required. County land-use regulations and plans that may be affected by the proposed pipeline are listed in Table 3.2.9-3.

1. POLA to Blythe. The principal documents regulating land-use planning along the proposed route are the comprehensive General Plans for the three counties encountered in California. These documents contain various planning elements used as guidelines to direct community growth patterns and ensure conformity with defined county development goals. In addition to the regulations identified in each respective county plan, the proposed project must be consistent with regulations mandated in various state and Federal agency plans. The plans that must be addressed in terms of land utilization associated with the proposed project are discussed below.

a. California Coastal Act of 1976. The Coastal Act provisions recognize the port and its facilities as primary economic and coastal resources, as well as essential elements in the national maritime industry. Under the act, the highest priority of use within the port is for development that is dependent on the harbor waters and the land/sea interface. Decisions to undertake specific development projects, where feasible, are to be based on a consideration of alternative locations and designs in order to minimize any adverse environmental impact.

b. The Port Master Plan. As stated in the Port Master Plan (POLA, 1979), the objectives of the plan are:

> ... to consistently develop, expand, and alter the port in both the short-term period and long-range period for purposes of commerce, navigation, fisheries, port-dependent activities and general public recreation consistent with the provisions of the California Coastal Act of 1976, the Charter of the City of Los Angeles, and all other applicable federal, state, county and municipal laws and regulations and to establish standards and criteria for the long-range orderly expansion and development of the port by the eventual aggregation of major functional and compatible land and water uses under a system of preferences which will result in the segregation of port facilities and operations into functional areas.

Development of land within the harbor as proposed by Pactex must be consistent with the long-term planning objectives specified in the Port's Master Plan. An amendment to the Port Master Plan will be submitted to the Coastal Commission for approval of this project.

c. City of Los Angeles-Port of Los Angeles Plan. The POLA plan is a part of the City of Los Angeles General Plan and provides a 20-year official guide to the continued development and operation of the port. It is designed to be consistent with the Port Master Plan prepared under the California Coastal Act.

Table 3.2.9-3 - County Land-Use Regulations and Policies

County	Land-Use Regulations and Policies	Plans/Permits Required	Miscellaneous Review
California			
Los Angeles	Comprehensive General Plan	Compliance with plans and regulations	Regional agencies plans and regulations
San Bernardino	General Plan Joint Utilities Management Plan	Site approval for pump station Disaster Plan	Flood Control District Road Department County Officials
Riverside	Comprehensive Plan Consolidated Corridor Plan	Consistency with plans	-
Arizona			
La Paz	None	ROW for county roads	None identified
Maricopa	Zoning Ordinance	None identified	Flood Control District Highway Department Health Department
Pinal	Zoning	None identified	None identified
Pima	General Land-Use Plan Zoning Ordinance Hillside Development Zoning Ordinance	None identified	None identified
Cochise	Land-Use Plan	Easement in County ROW Flood Plain Board	None identified

Table 3.2.9-3 (Contd)

County	Land-Use Regulations and Policies	Plans/Permits Required	Miscellaneous Review
New Mexico			
Hidalgo	None	None identified	None identified
Grant	None	County roads	None identified
Luna	Subdivision regulations	None identified	-
Town of Deming	Zoning	Pipeline requirements	None identified
Dona Ana	Comprehensive Policy Plan Zoning Ordinance Road Excavation Ordinance	Drainage Study Special Use Utility Construction in County ROW Grading in County ROW	None identified
Eddy	None	None identified	None identified
Lea	None	None identified	None identified
Texas			
El Paso	None	County Commissioners Court	-
Hudspeth	None	County Commissioners Court	-
Culberson	None	County Commissioners Court	-
Reeves	None	County Commissioners Court	-

Table 3.2.9-3 (Contd)

County	Land-Use Regulations and Policies	Plans/Permits Required	Miscellaneous Review
Texas (Contd)			
Loving	None	County Commissioners Court	-
Winkler	None	County Commissioners Court	-
Ector	None	County Commissioners Court	-
Midland	None	County Commissioners Court	Regional Transportation Plan

d. Joint Utilities Management Plan (JUMP). In addition to comprehensive land-use plans, San Bernardino County has a Joint Utilities Management Plan that controls the siting of electrical transmission lines and petroleum pipelines.

e. California Desert Conservation Area (CDCA) Plan, 1980. The goal of CDCA plan is to provide for the use of the public lands and resources of the CDCA, including economic, educational, scientific, and recreational uses, in a manner that enhances (wherever possible) and that does not diminish the environmental, cultural, and aesthetic value of the desert and its future productivity (BLM, 1980). The Energy Production and Utility Corridor Element of the plan seeks to minimize the proliferation of utility corridors through undisturbed desert and to promote further use of existing corridors. The proposed pipeline route would follow an established utility corridor, designated by the BLM as the K corridor.

2. Blythe to Pine Springs. County land-use regulations and policies are listed in Table 3.2.9-3. County land-use regulations and planning are limited in the counties for the pipeline segment through Arizona, New Mexico, and Texas. A review of construction plans is normally made by planning and zoning commissions, county commissioners, flood control districts, emergency service agencies, and fire prevention districts. Pima County, Arizona, has a hillside development ordinance that affects construction in steep terrain. The Yuma, Phoenix, and Safford Districts of the Arizona BLM would have land affected by the pipeline. Each is now developing a Resource Management Plan. The Phoenix and Safford Districts are in the process of drafting widerness EISs for the WSAs that are adjacent to the proposed pipeline route.

In New Mexico, the BLM Las Cruces District has a Resource Management Plan and has made an inventory of WSAs.

Fort Bliss Army Base would be crossed by the pipeline and has environmental regulations and designated historical areas. Texas regulates pipeline operation through the Railroad Commission.

3. Pine Springs to Midland. None of the counties traversed in this segment of the proposed route have a comprehensive General Plan regulating land use and development. In Midland County, the Midland-Odessa Regional Transportation Plan regulates access and development. The proposed project should be consistent with the Transportation Plan.

3.2.10 TRANSPORTATION, ENERGY, UTILITIES, AND PUBLIC SERVICES

A. Transportation

Three modes of transportation would be directly affected by the Pactex pipeline. Numerous major highways and railroads would be intersected by the pipeline, while POLA and the Santa Barbara Channel would be affected by tanker traffic to the pipeline terminal. The three modes are discussed below.

1. Highways. Major roadways that would be intersected by the Pactex pipeline are listed in Table 3.2.10-1. Major permits required for these crossings have been noted in the authorizing actions summarized in Table 1.3-1. A description of the major highways and their approximate locations is discussed in the following subsections.

a. POLA to Blythe. As shown in Table 3.2.10-1, 25 Federal and state highway crossings would occur in California, compared to 9 in Arizona, 14 in New Mexico, and 17 in Texas. The pipeline would require 65 crossings for the four-state routing. Thirteen highway crossings would be located in the Los Angeles County, 5 in San Bernardino County, and 7 in Riverside County. Five interstate highway systems would be affected, i.e., I-405, I-5, I-605, I-15E, and I-10 (crossed three times). I-405 would be crossed east of Torrance, I-5 near Montebello, I-605 at Puente Hills, I-15E south of its junction with I-10, and I-10 east of Garnet and twice more between Desert Center and Blythe.

State highway crossings would occur at Highway 7 east of Carson and at Garden Gate, 1 at Wilmington, 91 near Paramount, 42 east of its junction with 7, 72 and 19 near Pico Rivera, 60 at Hacienda Heights, Diamond Bar, Glen Avon, and Windmill, 39 at Hacienda Heights, 71 west of Diamond Bar, 83 at Chino, 31 south of Champagne, 79 at Beaumont, 111 at West Palm Springs, and 78 at Blythe.

b. Blythe to Pine Springs. The pipeline would cross U.S. 95 (Yuma County) and U.S. 80 (Maricopa County) in southwestern Arizona. I-10 would be intersected three times in Arizona near the towns of Casa Grande, Willcox, and Bowie. Other important highways to be crossed in south central and southeastern Arizona would include State Highways 93 (Casa Grande), 87/287 (south of Coolidge), 77 (southwest of Mammoth), and U.S. 89/80 (southwest of Coolidge).

The pipeline would parallel and Cross I-10 and its associated east-west roadways four times in New Mexico (twice near Lordsburg, once at Deming, and once at Anthony). New Mexico State Highway 11, a north/south route between the Mexican border and Deming, would be crossed by the pipeline south of Deming (Luna County). New Mexico State Highways 28 and 478 (Dona Ana County) parallel the Rio Grande River and are intersected by the pipeline in the vicinity of Anthony. State Highway 494 would be intersected south of Lordsburg, and state highways 418, 331, and 497 (Luna County) south of Demming. In Lea County, State Highway 652 would be crossed in the Paduca Breaks area and 18 south of Jal. In Eddy County, U.S. 285 would be crossed just north of the Texas border.

Table 3.2.10-1 - Pactex Pipeline Route: Major Road Crossings

California	Arizona	New Mexico	Texas
Los Angeles County	Yuma County	Hidalgo County	El Paso County
State 7	U.S. 95	I-10, U.S. 80	State 3255
State 1		State 494	State 2637
I-405	Maricopa County	I-10, U.S. 80/70	U.S. 54
State 7			
State 91	U.S. 80	Luna County	Hudspeth County
State 42			
I-5	Pinal County	I-10, U.S. 80/70	U.S. 180/62
State 72		State 418	State 62
State 19	State 93	State 331	State 2317
State 60	I-10	State 497	State 1111
I-605	State 87/287	State 11	U.S. 180/62
State 39	State 789, U.S. 80/89		
State 60	State 77	Dona Anna County	Culberson County
	Cochise County	State 28	U.S. 180/62
San Bernardino County		State 478	State 1108
	State 666/86, I-10	I-10 U.S. 80/85/180	State 652
State 71	I-10		
State 83		Eddy County	Winkler County
State 31			
State 60		U.S. 285	State 115
I-15E			
		Lea County	Ector County
Riverside County			
		State 652	State 181
State 60		State 18	U.S. 385
State 79			
I-10/U.S. 60			Midland County
State 111			
I-10/U.S. 60			State 1788
I-10/U.S. 60			State 349
State 78			U.S. 80

Source: ES, 1985.

c. Pine Springs to Midland. In Texas,the pipeline would intersect U.S. 54 north of El Paso, U.S. 180/62 twice in Hudspeth County and once in Culberson County, U.S. 385 in Ector County (north of Odessa), and U.S. 80 at Midland. State Highways 3255 and 2637 are intersected in El Paso County, 2317 and 1111 in Hudspeth County, 1108 and 652 in Culberson County, 115 in Winkler County, 181 in Ector County, and 1788 and 349 in Midland County.

2. Railroads. Table 3.2.10-2 presents a summary of railroad crossings by the Pactex pipeline from California to Texas. The pipeline would cross 37 railroad lines along its routing, with 22 of these occurring in California.

3. Marine Traffic. The Ports of Los Angeles and Long Beach play a vital role as a major U.S. port complex and constitute a significant source of economic activity for both the region and the nation. The growth of international trade has been impressive over the years because the Los Angeles and Long Beach harbors are the principal U.S. gateway for trade with Japan and the balance of the great Pacific Basin. In total value of waterborne foreign trade (exports and imports combined), the Los Angeles customs district ranks second in the nation, exceeded only by New York. These ports handle more cargo tonnage, including both foreign trade and domestic cargos, than any other west coast port and, together, represent more than 40% of the total west coast tonnage.

The existing marine traffic environment includes the Los Angeles and Long Beach Harbor area, which is formed by the Federal breakwater in San Pedro Bay. The Federal breakwater consists of the San Pedro, the Middle, and the Long Beach breakwater sections.

POLA is one of the principal ports on the west coast for the offloading of crude oil, the receipt and shipment of petroleum and petrochemical products, the provisioning of vessel bunkering activities, and storage of liquid bulk commodities. POLA itself is a port of call for the vessels of about 70 steamship lines and agents with shipping service to 200 world ports. Wharves have been constructed along more than 10 miles of the port's 28-mile waterfront. There are more than 35 shipping terminals and 71 berths. Other water-related facilities include shipyards, tug and barge operations, pleasure craft marines, and fish operations.

a. Ports of Los Angeles and Long Beach. Commercial marine traffic activity statistics for the Ports of Los Angeles and Long Beach are presented in Tables 3.2.10-3 through 3.2.10-5. Table 3.2.10-3 indicates that total annual commercial arrivals at the POLA declined from 3,813 to 3,157 or 17% over the 1980 to 1984 period, while the Port of Long Beach increased 15% from 3,309 to 3,818 arrivals. Total combined arrivals for the two ports declined 2% over the period. The total number of bunkers at the two ports dropped 25% over the same period. Table 2.2.10-4 provides a breakdown by type of vessel arriving at the ports. The great majority of vessels (76%) carry dry cargo, while tankers constitute 18% of total commercial movements. An average of 3.5 tankers arrived daily at the ports from 1980 to 1984. Table 3.2.10-5 indicates a gradual decline in tanker arrivals over the past years, some of which is attributable to an increase in the average tanker size, as evidenced by the increase in average net tonnage per vessel arrival.

Table 3.2.10-2 - Railroad Crossings Along the Pactex Pipeline Routing

California	Arizona	New Mexico	Texas
Los Angeles County Southern Pacific (8) Union Pacific (7) Atchison, Topeka and Santa Fe (1)	Maricopa County Southern Pacific (2)	Hidalgo County Southern Pacific (2)	El Paso County Atchison, Topeka and Santa Fe (1) Southern Pacific (1)
San Bernardino County Union Pacific (1) Atchison, Topeka and Santa Fe (1) Southern Pacific (1)	Pinal County Southern Pacific (2)	Luna County Southern Pacific (1)	Midland County Texas and Pacific (1)
Riverside County Southern Pacific (1) Atchison, Topeka and Santa Fe (1) Eagle Mountain Mining (1)	Cochise County Southern Pacific (2)	Dona Ana County Southern Pacific (1)	
		Eddy County Atchison, Topeka and Santa Fe (1)	
		Lea County Texas-New Mexico (1)	

Note: Figures in parenthesis ( ) indicate the number of crossings.
Source: Pactex, 1985.

Table 3.2.10-3 - Total Commercial Vessel Arrivals for Los Angeles/Long Beach Harbors

Year	Vessel Arrivals POLA	Vessel Arrivals POLB	Total	Bunkers Only	Vessel Net Tonnage (000 tons)
1980	3,813	3,309	7,122	2,545	101,237
1981	3,851	3,492	7,343	2,853	105,658
1982	3,324	3,442	6,766	2,223	103,067
1983	3,067	3,472	6,539	1,764	99,718
1984	3,157	3,818	6,975	1,922	101,516

Source: Marine Exchange of Los Angeles-Long Beach Harbor, Inc., Vessels Arrivals and Departures at Los Angeles-Long Beach Harbor, January 1, 1981, to January 1, 1985.

Table 3.2.10-4 - Commercial Vessel Arrivals by Type of Vessel for Los Angeles-Long Beach Harbors

Year	Cargo Vessels	Tankers	Passenger Vessels	Seagoing Barges	Total
1980	5,503	1,283	151	186	7,122
1981	5,542	1,396	240	165	7,343
1982	5,010	1,381	263	112	6,766
1983	4,847	1,240	292	160	6,539
1984	5,359	1,127	325	164	6,975
Annual Average	5,252	1,285	254	158	6,949
Distribution (%)	76	18	4	2	100

Source: Marine Exchange of Los Angeles-Long Beach Harbor, Inc. Vessels Arrivals and Departures at Los Angeles-Long Beach Harbor, January 1, 1981, to January 1, 1985.

Table 3.2.10-5 - Tanker Arrivals by Net Tonnage Los Angeles-Long Beach Harbors

Year	Tanker Arrivals (No.)	Total Net Tonnage (000)	Average Net Tonnage Per Vessel Arrival
1980	1,283	34,046	26,536
1981	1,396	34,783	24,916
1982	1,381	36,618	26,516
1983	1,240	36,170	29,169
1984	1,127	31,573	28,015

Source: Marine Exchange of Los Angeles-Long Beach Harbor, Inc., Vessels Arrivals and Departures at Los Angeles-Long Beach Harbor, January 1, 1981, to January 1, 1985.

b. Santa Barbara Channel. In 1983, the California Coastal Commission contracted the California Maritime Academy (CMA) to conduct a traffic study of the Santa Barbara Channel. The results of the study, which lasted 75 days, indicated that 41.5% of the total Los Angeles-Long Beach arrivals and departures used the Santa Barbara Channel. Table 3.2.10-6 shows that the average daily commercial movements in the Santa Barbara Channel ranged from 14.8 to 16.8 from 1980-1984.

c. Anchorages. The USCG has jurisdictional responsibility for establishing, defining, and regulating anchorages. Each anchorage has the following designations: specific area, designated or preferred use (bunkering, lightering, extended anchoring), time limitation for use, requirements for anchoring, and other operational considerations (and restrictions).

The purposes of anchorage include enhancement of marine traffic safety by ensuring safe access corridors, minimizing vessel-to-vessel encounters (reducing accident potential), and establishing safer vessel operations while at anchorage and reducing the potential for oil spills and other risks of upset from lightering and bunkering operations.

The designated anchorage grounds in San Pedro Bay are shown in Figure 3.2.10-1.

Of the 49 commercial anchorage positions available in the Ports of Los Angeles and Long Beach, 30 positions allow bunkering activities. Anchorage is a source of revenue to the POLA. Also provision of food, fuel, and other supplies to bunkered vessels represents an important source of business to the private sector.

Table 3.2.10-6 - Santa Barbara Channel Commercial Traffic Density

Year	Total Arrival Departures at POLA/POLB	Estimated Santa Barbara Channel Movements	
		Annual	Daily
1980	14,254	5,915	16.2
1981	14,766	6,128	16.8
1982	13,546	5,622	15.4
1983	13,062	5,421	14.8
1984 (prelim est.)	13,900	5,769	15.8

Source: Table 3.2.10-4 and ES, 1985.

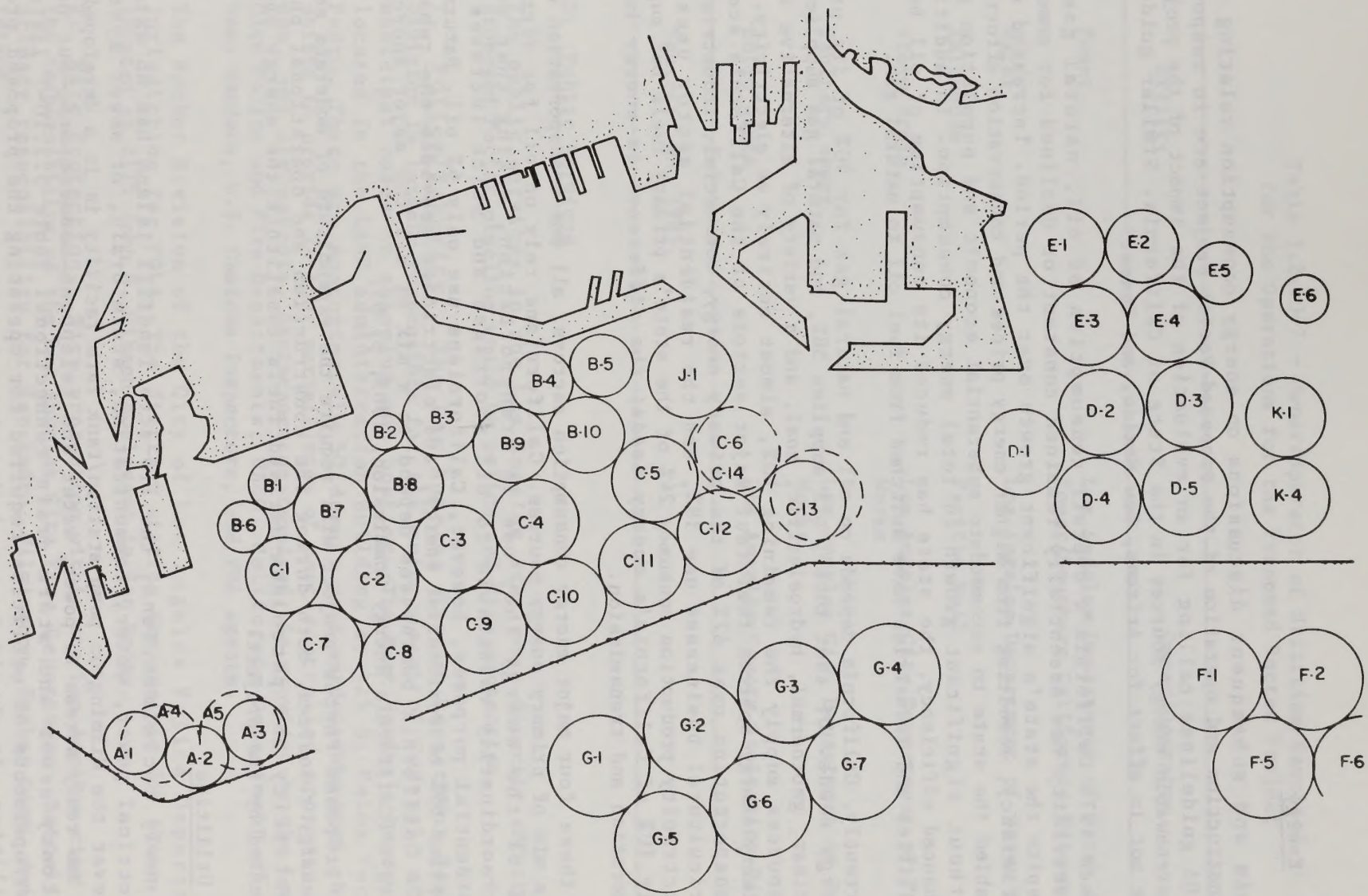


Figure 3.2.10-1 - Existing Anchorages in San Pedro Bay
(LAHD, 1985)

B. Energy

This and subsequent discussions on energy consumption relating to the construction and operation of the proposed Pactex project are in response to CEQA guidelines calling for an evaluation of the impact of the project on nonrenewable energy sources in the State of California. Similar guidelines are not in effect for Arizona, New Mexico, and Texas.

Since 1974 California's overall consumption of oil, natural gas, and electricity has essentially remained constant or declined for some fuels despite the state's significant growth over the period. Increased energy efficiency, resulting from higher energy prices and conservation efforts, has enabled the state to accommodate substantial economic and population growth without significant growth in total energy consumption. In addition to enhanced efficiency, the state has reduced its consumption of oil because utilities and industries have switched from fuel oil to natural gas.

Currently, California depends on oil and natural gas for 90% of its primary energy needs. Of that total, oil supplies 58%, and natural gas supplies 32%. Nuclear, geothermal, hydroelectric, coal, and a variety of alternative energy resources supply the remaining 10%, almost entirely as electricity. These primary energy sources fuel four major sectors of the California economy. Transportation uses 47% of the primary energy, commercial, industrial, and agricultural businesses use 39%, and the residential sector uses 14%. Electricity production consumes 24% of the state's primary fuels but supplies only 10% of California's energy needs; the difference is energy lost in generation and transmission.

Of these four major energy consumption sectors, all but transportation depend on a mix of primary energy sources. Californians rely on oil for virtually all of the energy they use in transportation, making that sector extraordinarily vulnerable to oil shortages and price increses. For residential purposes, however, Californians use only 6% oil. Natural gas supplies 69% of residential energy, and electricity provides the remaining 24%. California businesses depend on a mix of all the major sources of energy. (California Energy Commission, 1983, p. 6).

The proposed Pactex project will require the expenditure of moderate amounts of energy resources, both during the construction and operational phases. Electricity and petroleum-derived fuels constitute the energy sources affected by the project.

C. Utilities

As newly reclaimed land, the 115-acre landfill island has no existing electrical power, water, communication, storm drain, or sewer systems. However the Wilmington pump station/tank farm facility is in a developed area and has ready access to power, water and telephone connections, but not to sanitary sewer and storm drain connections. Table 3.2.10-7 lists the owner/operators of utilities required for operating the proposed project facilities. It should be noted that there is no requirement for natural gas at either location.

Table 3.2.10-7 - Owner/Operator of Utilities Required for the Operations for the Proposed Pactex Project

Utility	Owner/Operator
Power	Los Angeles Department of Water & Power/Southern California Edison
Water	Los Angeles Department of Water & Power
Telephone	Pacific Bell
Storm drain	Los Angeles City Department of Public Works
Sanitary sewer	Los Angeles City Department of Public Works
Solid waste	Los Angeles County Sanitation District

Source: ES, 1985.

D. Public Services

The public services in the Los Angeles area most directly affected by the proposed Pactex pipeline would be police and fire protection.

1. Police/Security. The Los Angeles Harbor Department Port Warden Division is largely responsible for the enforcement of Federal, state, and municipal codes on shipping and boating. The Port Warden's headquarters is located in the LAHD Administration Building at 425 S. Palos Verdes, San Pedro. There are approximately 50 deputy port wardens who work three daily shifts to provide 24-hour surveillance of port-controlled property by land, sea, and air patrols. Assistance as required, is provided by the Los Angeles City Police and Fire Departments, USCG, California Department of Fish and Game Wardens, U.S. Customs Inspectors, and FBI agents.

The Harbor Division of the City of Los Angeles Police Department has jurisdiction for POLA. The district station responsible for these areas are located at 2175 John S. Gibson Boulevard in San Pedro.

2. Fire Protection. Fire protection within the Los Angeles city limits is the responsibility of the Los Angeles City Fire Department. Battalion 6 has primary responsibility for San Pedro, Wilmington, Harbor City, and Terminal Island.

Battalion 6 consists of:

Fire Station	Location	Type of Function
38	124 E. "I" St., Wilmington	Task Force
40	330 Ferry Street, POLA	Task Force
48	1601 S. Grand Ave., San Pedro	Task Force
49	400 Matsonia Way, POLA	Task Force & Fireboats 3&4
53	438 N. Mesa Ave., San Pedro	Single Engine Company
85	1221 253rd Street, Harbor City	Task force
101	1441 25th Street, San Pedro	Single Engine Company
110	Berth 43, POLA	Fireboat 5
111	Berth 260, POLA	Fireboat 1
112	Berth 227, POLA	Fireboat 2

3. U.S. Coast Guard. The Eleventh Coast Guard District, with headquarters in Long Beach, California, is one of 12 Coast Guard districts throughout the United States. The geographic area of the Eleventh District includes California south of the Santa Maria River; the state of Arizona; Clark County, Nevada; and four counties in southwest Utah. The Coast Guard's responsibilites are best described within three areas:

(1) Maritime Safety: boating safety, Merchant Marine safety, port safety, aids to navigation, ocean operations/icebreaking, and search and rescue.

(2) Maritime Law Enforcement: port security, enforcement of laws and treaties, environmental protection.

(3) Military Preparedness: as one of our nation's five armed forces.

In the Long Beach area, Coast Guard military and civilian personnel are stationed primarily in three areas:

(1) District Office located in the Union Bank Building at 400 Oceangate where the District Commander directs the affairs of the district with an administrative staff of 230 military and civilian personnel. This office is the primary Coast Guard unit in the Los Angeles area.

(2) Marine Safety Office Los Angeles/Long Beach at 165 N. Pico Avenue, from which vessel inspections, pollution response, merchant seaman licensing, vessel documentation, and other marine safety functions are performed by 101 personnel under the command of the Captain of the Port.

(3) Coast Guard Base Terminal Island, which encompasses the District Personnel Support Center and the District Reserve Office and Training Center. It is also the home port for the district's fleet of cutters and patrol vessels.

3.2.11 CULTURAL RESOURCES

The data regarding known cultural resources in and near the Pactex project area was compiled and summarized from a series of technical reports. These reports were prepared for sections of the corridors for the SOHIO, All-American, and Pactex projects and were derived from searches of the cultural resources literature, the records of the State Historic Preservation Offices of California and Texas, and the records of regional clearinghouses for areas along the project corridor. The following technical data sources were reviewed:

(1) General: BLM, 1984a.

(2) POLA: COE, 1984d; Stickel, 1984; Stickel and Cox, 1985.

(3) California: Greenwood, 1975; Williams Brothers, 1976; Foster and Greenwood, 1985; Carrico and Thesken, 1982.

(4) Arizona: Effland and Green, 1984; Greenwood, 1985; Carrico and Quillen, 1982.

(5) New Mexico-Texas: Brethauer, 1977; Bamforth, 1984; Carmichael, 1985a, 1985b.

As indicated by the above bibliography for the corridor, the cultural resources were reviewed several times; general descriptions of the cultural settings are found in the above documents.

The cultural resources of the Pactex corridor (including the two terminals) are summarized in the tables of cultural sites, types, and sensitivities (Tables 3.2.11-1, -2, and -3, respectively). The data presented in these tables will require updating prior to construction because of a recent alignment change in West Texas and possible future realignments. Cultural resources listed within the corridor are generally located within the mile-wide corridor of the proposed Pactex pipeline alignment or terminal sites. Cultural resources discussed in the impact section will largely involve those in the proposed project ROW that lie within 100 ft of the proposed construction ROW centerline.

Criteria to evaluate cultural resources on Federal property are based on a determination of eligibility for and listing on the National Register of Historic Places issued in 36 CFR 60.4 (revised November 1984). These criteria may be applied to historic and prehistoric resources. Furthermore, the California Environmental Quality Act (CEQA) has similar criteria for evaluating cultural resources (California Administrative Code, Title 14, Natural Resources, Division 6, Resources Agency, Appendix K). The following list includes the agency responses to a letter from POLA on the requirements for cultural resources within their jurisdiction:

(1) California Department of Transportation, Los Angeles District - Caltrans requires evidence that Section 106 of the National Historic Preservation Act has been followed.

Table 3.2.11-1 - Known Cultural Resource Sites from the Mile-Wide Corridor of the Pactex Project

Sections[a]	Sites and Register Status					
	Listed NRHP	Determined Eligible	Potentially Eligible	Potentially Ineligible	Ineligible for NRHP	Unknown Status[b]
POLA	-	-	2	-	-	7
California	2	-	9	6[c]	1	51
Arizona	-	-	18(3)	22	-	109
Western New Mexico	-	-	-	-	5	38
Far West Texas and West Texas	1	-	156	-	-	19
East New Mexico, West-Central Texas	-	-	10	1	-	24
Total	3	-	198	29	6	248

() = number in parentheses indicates state inventory eligibility pending.
[a]Corridor sections from El Paso to Midland are divided as follows: Far west and west Texas from El Paso to the Texas/New Mexico state line. East New Mexico, West-Central Texas from the southern New Mexico state line to Midland, Texas.
[b]Unknown status refers to sites with insufficient data to determine eligibility. No evaluation was made for sites outside the ROW.
[c]Four sites are reported destroyed and current conditions need verification.
Source: Foster and Greenwood, 1985; Greenwood, 1985; and Carmichael, 1985a, 1985b.

Table 3.2.11-2 - Pipeline Segments and Types of Known Cultural Resources from the Mile-Wide Corridor of the Pactex Project

Type	Sections[a] and Resource Type						
	POLA	CA	AZ	WNM	FWTX	WTX	ENM and WCTX
Village	-	6	7	2	37	-	-
Campsite	-	18	15	16	124	7	33
Scatters	-	-	6	5	-	-	-
Lithic	-	14	15	7	-	-	-
Ceramic	-	2	6	7	-	-	-
Features							
Shelter/cave	-	2	-	1	-	-	1
Rock ring	-	2	7	-	-	-	-
Trail	-	5	3	-	-	-	-
Rock art	-	2	1	-	-	-	-
Quarry	-	-	2	-	2	-	-
Milling sites	-	4	-	-	-	-	-
Historic features							
Ranch/town	-	3	3	-	-	-	1
Village	-	1	1	-	-	-	-
Structure	2	4	4	-	2	-	-
Cemetery	-	2	2	-	-	-	-
Dump	-	-	3	2	2	-	-
Chapel	-	1	-	-	-	-	-
Route	-	-	2	-	-	-	-
Shipwreck sites	7	-	-	-	-	-	-
Unknown	-	3	75	3	2	-	-
Total	9	69	152	43	169	7	35

[a]Corridor sections from El Paso to Midland are divided as follows:
POLA = Port of Los Angeles
CA = California
AZ = Arizona
WNM = Western New Mexico
FWTX = Far West Texas from El Paso to the Guadalupe Mountains
WTX = West Texas from the Guadalupe Mountains to the Texas/New Mexico state line
ENM = East New Mexico from the southern to the eastern state line
WCTX = West-Central Texas from the Texas/New Mexico state line to Midland
Source: Summarized from various reports referenced in text.

Table 3.2.11-3 - Pipeline Segments and Sensitivity for Known/Potential Cultural Resources in the Mile-Wide Corridor of the Pactex Project

Sensitivity	Corridor Sections[a] and Known/Potential Portions						
	POLA (acre)	CA (mile)	AZ (mile)	WNM (mile)	FWTX-WTX (mile)	ENM (mile)	WCTX (mile)
High	-	61	95	34	83	55	34
Moderate	-	12	230	16	35	23	47
Low/none	508[b]	155	27	98	14	0	7
Total	508[b]	229	357	148	132	78	88

[a]Corridor sections from El Paso to Midland are divided as follows:
POLA = Port of Los Angeles
CA = California
AZ = Arizona
WNM = Western New Mexico
FWTX = Far West Texas from El Paso to the Guadalupe Mountains
WTX = West Texas from the Guadalupe Mountains to the Texas/New Mexico state line
ENM = East New Mexico from the southern to the eastern state line
WCTX = West-Central Texas from the Texas/New Mexico state line to Midland
[b]Sensitivity in POLA by acres.
Source: Summarized from various reports referenced in text.

(2) California Department of Transportation, San Diego District - Caltrans follows Title 36 CFR, Part 800.

(3) City of Banning, California - CEQA compliance.

(4) City of Long Beach, California - requirement for architectural analysis.

(5) Advisory Council on Historic Preservation, Washington D.C. - compliance with Section 106 and Council procedures.

(6) California State Lands Commission - locate and identify cultural resources.

(7) County of San Bernardino, Land Management Department - follow county guidelines.

(8) County of Los Angeles, Department of Regional Planning - follow county guidelines.

(9) County of San Bernardino, Environmental Public Works - follow county guidelines.

(10) City of Redlands, California - list all structures according to the NRHP, inventory cultural resources, evaluate impacts, and develop mitigation measures.

(11) City of South Gate, California - no resources have been identified in the Pactex project area.

The interpretations and designations of cultural resources along the Pactex corridor are presented in the technical reports and reflect the presence of known archaeological sites; known geological, soil, biological, hydrological, and topographical features; and the experience of archaeologists familiar with the field occurrences of cultural resources along the corridor or region. Sensitivities established in the various technical reports referenced above generally reflect the following elements:

(1) High sensitivity areas that contain important sites or environmental features typical of other areas known to contain important sites.

(2) Moderate areas with lower density of known sites and with only a few important features relating to human occupations.

(3) Low areas where few sites occur and with little potential for listing them on the NRHP, based on environmental features and those areas, generally, where urban and agricultural developments may have destroyed archaeological materials.

The designated portions of the corridor (in miles) are summarized in Table 3.2.11-3.

A. POLA

The Pactex terminal facility and pipeline lie primarily in open water, south of Terminal Island. Cultural resources have been found in these areas (Foster and Greenwood, 1985). These include seven possible shipwreck sites and two structures within the mile-wide zone of the pipeline route. The structures are potentially eligible for listing in the NRHP; one floating ship listed on the NRHP was relocated.

B. California

Three areas in the vicinity of the Pactex corridor contain numerous recorded archaeological sites: San Bernardino, Coachella Valley, and Desert Center. Of the 69 recorded sites in the corridor, two sites are listed on the NRHP, and nine sites were determined to be eligible or are considered to be potentially eligible for nomination to the NRHP (Table 3.2.11-1). Seven other sites in or

near the ROW were considered as ineligible for nomination. About 50 other sites lie within the corridor but are not in or near the ROW and do not have sufficient data to determine eligibility, although some may be eligible. All sites are further identified in the technical reports (Carmichael, 1985a, 1985b; Greenwood, 1985; Foster and Greenwood, 1985).

As indicated in Table 3.2.11-2, most prehistoric sites were considered to have been campsites. Six village sites lie within the corridor; one site in or near the ROW was considered as potentially eligible for nomination to the NRHP. Three other village sites may have been destroyed by development, in which case they may be ineligible. If they were not destroyed, the remaining undisturbed portions may be considered as eligible. One campsite was determined to be eligible for nomination, and four camps were considered to be potentially eligible. Other sites include trails, lithic and ceramic scatters, rock art, and an Indian cemetery, which may have been destroyed.

Historic remains in the California corridor reflect the historic development of the region with proto-historic Indian village, combined Indian villages and ranches, two cemeteries, and chapel and cemetery, which are followed by two wineries and then army camps (World War II) in the desert. Many of these resources were badly damaged and some may have been destroyed, based on available records.

Based on the interpretations from known cultural resources and cultural and environmental patterns, portions of the California corridor were evaluated for their potential to contain additional resources and were given a three-level sensitivity designation: low, moderate, and high (Table 3.2.11-3). Three major portions of high sensitivity occur along the corridor near San Bernardino, in the Coachella Valley, and near Desert Center. Twelve areas of moderate sensitivity or small segments of high sensitivity occur between the three larger segments of high sensitivity. The high and moderate portions of the corridor represent only about a third of the total length of the corridor in California and generally occur along lower flanks of hills and ridges and near sources of water.

The corridor segments with low sensitivity include long portions at the west and east ends of the California corridor that were disturbed by urban and agricultural development. A cemetery and three large village sites may have been partially destroyed by development. In some areas, landfilling may have buried some sites, while some sites may have been destroyed by deep excavations associated with general urban development and other projects. It is presently unknown how many sites may be found for each sensitivity designation.

C. Arizona

Cultural resources along the Arizona section of the corridor were discussed in the All-American EIR/EIS (BLM, 1985a, p. 3-91), the technical resources report for Arizona (Effland and Green, 1984), and the Palo Verde-Devers report (Carrico and Quillen, 1982). The summary below was derived from these reports and the review by Greenwood (1985).

The archaeological and historic resources along the Arizona section of the corridor are diverse and include many historic features (Table 3.2.11-2). Historic settlements, graves, mining facilities, and stage stations and routes lie within the corridor. Several village sites extend over many acres and a few reach 100 acres or more. Although no site has yet been listed on the NRHP, three historic sites were considered for nomination to the state listing; 18 archaeological sites also appear to contain sufficient materials for designation as potentially eligible for the NRHP.

The interpreted sensitivity for expected cultural resources (Effland and Green) indicated a much higher level of potential for cultural resources compared to California and New Mexico; about a third of the corridor was designated as high sensitivity, and only 27 miles were designated as low sensitivity. High sensitivity areas generally lie in the eastern portion, with three limited segments in the central and western portions of the corridor. It is presently unknown how many sites may be found for each sensitivity designation.

D. Western New Mexico and West Texas

The cultural resources for the corridor in the western half of New Mexico and from near El Paso to near the Pecos River were presented in the All-American EIR/EIS (BLM, 1984a, p. 3-92) and technical reports (Reed, 1984; Bamforth, 1984; Carmichael, 1985a, 1985b). This section of the corridor includes Fort Bliss, which is the most thoroughly investigated area for cultural resources along the entire project (171 sites in 5 miles). The difference in level of study is reflected in Tables 3.2.11-1 and -2, which indicate that more sites are found in the far west Texas section, including Fort Bliss, than any other section of the entire corridor. This difference stems from Ft. Bliss requiring intensive cultural resource inventories under the Historic Preservation Plan, while adjacent areas require a less intense survey.

One historic/archaeological site is listed on the NRHP (Tables 3.2.11-1 and -2). Other sites were not assigned an eligibility status, although the unique group of a wide range of cultural activity sites on Fort Bliss may make the area eligible as a district for nomination to the NRHP.

Only two portions of the western New Mexico corridor were designated by Reed (1984) as high or even moderate sensitivity for cultural resources: near Lordsburg and the Rio Grande. About two-thirds of the corridor were designated as low sensitivity (Table 3.2.11-3).

In the western Texas section (west of the Pecos River), most of the corridor was designated by Bamforth (1984) and Carmichael (1985a) as high and moderate sensitivity, while only 14 miles were designated as low sensitivity. It is presently unknown how many sites may be found for each sensitivity designation.

E. Eastern New Mexico and West-Central Texas

The remaining section of the Pactex project corridor from the Texas/New Mexico state line near the Pecos River to the Midland terminal was discussed

in the technical report for this portion of the Pactex project (Carmichael, 1985b) and in an earlier survey report for the SOHIO project (Brethauer, 1977).

A review of the 35 site records indicated that at least 10 sites may be potentially eligible for nomination, 1 is potentially ineligible, and 24 other sites in the corridor were of undetermined eligibility (Table 3.2.11-1); 5 of these 24 sites were disturbed previously, while the remaining 19 were described as intact. Known sites in or along the corridor are concentrated in two groups in New Mexico and one group in Texas.

The lack or limited nature of field surveys in this section led Carmichael (1985b) to designate the majority of the segment into high and moderate sensitivity with some limited areas as low: 89 miles of high, 70 miles of moderate sensitivities, and 7 miles of low (Table 3.2.11-3). The field surveys of the Jal-Midland portion of the proposed SOHIO corridor found only one site within the proposed SOHIO ROW, while 35 sites are now known within the 1-mile-wide corridor. It is presently unknown how many sites may be found for each sensitivity designation.

3.2.12 PALEONTOLOGY

Previously recognized fossil occurrences are recorded sporadically within and along the entire length of the 1-mile-wide pipeline corridor. A small number of these records have been described in published and unpublished documents. The following data search was conducted to establish an inventory of known fossil occurrences within the corridor:

(1) Archival searches were conducted at local museums and institutions in southern California, Arizona, New Mexico, and Texas that contain fossil collections from the project area. The institutions accessed include the Universities of California at Los Angeles and Riverside; Natural History Museum of Los Angeles County, Los Angeles; San Bernardino County Museum, Redlands, California; Museum of Northern Arizona, Flagstaff; Univerity of Arizona Laboratory of Paleontology, Tuscon; Arizona State University, Tempe; University of New Mexico, Albuquerque; Texas Christian University, Dallas; and University of Texas Balcones Research Center, Austin.

(2) Paleontologic literature on the area was reviewed and is cited below.

(3) Paleontologists having detailed knowledge of the area were consulted.

A technical report based on the data search and containing detailed information on the paleontologic resources of the project area was prepared (Lander, 1985). To protect fossil localities from unauthorized collecting, this report will be made available only to qualified investigators by the BLM and LAHD. A summary of the technical report search is presented below, beginning with those resources at the western end of the pipeline route. Other occurrences may be recorded from the corridor but have not been included because they are unpublished, are not catalogued, have not been plotted on topographic maps, are not accurately located, or are at distant museums that could not be accessed for this study.

Paleontological resources within the corridor include the known fossil occurrences (specimens), at least 37 recorded fossil localities, the fossil-bearing strata that produced these remains and contain these localities, and strata with the potential for containing particular types of fossils within the corridor because they have produced similar fossils outside of the corridor. Strata with a high potential for producing fossils are likely to yield comparatively common remains. Strata with a moderate potential are less likely to produce fossils in such numbers. Strata with a low potential are likely to contain very few, if any, fossils. The geographic distribution of exposures of particular fossil-bearing and potentially fossiliferous rocks within the corridor is determined from published geologic maps of the project area. With the exception of portions of Arizona, geologic map coverage is available for the entire route.

The level of importance of the paleontological resource in a particular area of exposure is based on an evaluation by paleontologists working in the project area of known or potential type and frequency of fossil occurrences in fossiliferous or potentially fossil-bearing rocks.

Vertebrate remains are comparatively rare in the fossil record. Therefore, localities or strata containing these remains are considered more important than those containing invertebrate remains, which are relatively common. Localities or strata containing relatively few remains are considered less important than those containing numerous similar fossils (particularly if the latter remains represent a diverse assemblage), unless the remains represent comparatively rare taxa. Localities or strata containing associated vertebrate fossils and invertebrate or plant remains are considered highly important because of the potential for detailed correlation of their respective time scales (e.g., the North American land mammal ages with the Pacific Coast marine molluscan stages) and paleoecological reconstruction. Associations of vertebrates and paleo-Indians are important because of the information they provide regarding ancient cultures (subsection 3.2.11) and the causes of late Pleistocene extinctions of land mammals. Fossil-bearing and potentially fossiliferous rocks of the same formation are assigned the same level of importance, based on similar types and frequencies of known and potential fossil occurrences, the evaluations by paleontologists working in the area, and on the low confidence in available survey data for a more complete evaluation.

These criteria are considered the most amenable for the evaluation and ranking by importance of particular intervals along the corridor because they are based on known and potential fossil occurrences in particular fossil-bearing and potentially fossiliferous rock units with previously delineated areas of exposure.

The specific criteria used in defining the particular levels of importance and potential occurrence recognized in this report include:

(1) High

(a) Area with formation containing numerous vertebrate fossil localities and/or specimens (high potential), particulary if the specimens comprise a diverse vertebrate assemblage.

(b) Area with formation containing associated vertebrate and invertebrate or plant fossil localities and/or specimens (variable potential).

(c) Area with formation containing vertebrate specimens representing comparatively rare species (variable potential).

(2) Medium

(a) Area with formation containing comparatively few, isolated vertebrate fossil localities (moderate potential), each yielding only very few or single species or specimens.

(b) Area with formation containing abundant, diverse invertebrate assemblages (high potential).

(c) Area with deposits of nearshore or terrestrial origin that may contain vertebrate fossils (moderate potential).

(3) Low

(a) Area with coarse sediments containing very few or no invertebrate and no vertebrate fossils (low potential).

(b) Area with deep ocean deposits or slightly metamorphosed deposits containing very few or no invertebrate and no vertebrate fossils (low potential).

(4) None: areas with granite, lavas, and other igneous and highly metamorphosed rocks that do not contain fossils.

Known and potential paleontologic resources within the corridor are summarized by area and formation in the following discussion and in Tables 3.2.12-1, -2, and -3. Detailed information regarding these resources is contained in the paleontological resource report for this project (Lander, 1985). This information will require updating prior to construction because of the recent alignment change in West Texas, as well as any future realignments. Only formations exposed in the corridor are discussed below. Formation names are replaced by numbers to protect the resource from unauthorized collection. These numbers are keyed to the resource report (Lander, 1985).

A. POLA

The proposed dredging area and landfill island site are underlain by Quaternary sediments (Formation 2.2.1) containing fragmentary invertebrate remains of possible late Pleistocene age. The remains occur within 5 to 10 ft of the sea floor. Miller (1971) reported late Pleistocene land mammal remains from similar deposits several miles east of the corridor. One specimen was collected 500 ft offshore; another may have been uncovered by dredging operations.

B. California

1. Southwestern (between POLA and Diamond Bar). Late Pleistocene fossils are reported from areas of Quaternary alluvium within and near the corridor by Greenwood (1975) and Williams Brothers Environmental Services (1976). These occurrences may be from the alluvium or the underlying Quaternary terrace deposits (Formation 2.2.2), which have produced late Pleistocene land mammal remains within and near the corridor (Greenwood, 1975; Williams Brothers Environmental Services, 1976; Kennedy, 1975; Miller, 1971). Some of the latter records were subsurface occurrences.

The underlying marine Formation 2.2.3 has produced abundant, diverse invertebrate assemblages of Pliocene age outside of the corridor (Yerkes, 1973) and one mammalian fossil from inside the corridor. The underlying marine Formation 2.2.4 has produced leaves of land plants, clams, sharks, and at least 20 species of bony fish, birds, and marine and land mammals (Chaney, 1921; Durham and Yerkes, 1964; Schoellhamer et al., 1981; Stock, 1928). Only fish have been collected in the corridor.

Table 3.2.12-1 - Importance of Formations in Pactex Corridor and Potential For Producing Fossils

Location	Formation[a] (age)	Potential (vertebrate/ invertebrate)	Importance
POLA	2.2.1 (Pleistocene)	Moderate/high	Moderate
California	2.2.2 (Pleistocene)	High/low	High
	2.2.3 (Pliocene)	Moderate/moderate	Moderate
	2.2.4 (Miocene)	High/moderate	High
	2.2.5 (Pleistocene)	Moderate/low	Moderate
	2.2.6 (Pleistocene)	High/low	High
	2.2.7 (Pliocene)	High/low	High
	2.2.8 (Pliocene)	Low/moderate	Moderate
	2.2.9 (Pleistocene)	Moderate/low	Moderate
	2.2.10 (Pliocene-Pleistocene)	High/low	High
Arizona	2.2.12 (Pleistocene)	High/low	High
	2.2.13 (Miocene)	Low/moderate	Moderate
	2.2.15 (Oligocene, Miocene, Pleistocene)	High/low	High
	2.2.16 (Tertiary)	Moderate/low	Moderate
	2.2.17, .18 (Pleistocene)	Moderate/low	Moderate
Southwestern New Mexico	2.2.19 (Pleistocene)	Moderate/low	Moderate
	2.2.20 (Miocene)	Moderate/low	Moderate
	2.2.21 (Pleistocene)	High/low	High
	2.2.22 (Permian)	Low/high	Moderate
West Texas	2.2.22 (Permian)	Low/high	Moderate
	2.2.23 (Cretaceous)	Moderate/moderate	Moderate
	2.2.24 (Permian)	Low/moderate	Moderate
	2.2.25 (Permian)	Low/moderate	Moderate
	2.2.26 (Permian)	Low/low	Low
	2.2.27 (Permian)	Moderate/high	High
Southeastern New Mexico	2.2.28 (Permian)	Low/moderate	Moderate
	2.2.29 (Triassic)	Moderate/high	Moderate
	2.2.30 (Miocene-Pliocene)	Moderate/low	Moderate
	2.2.31 (Pleistocene)	Moderate/low	Moderate
West-Central Texas	2.2.31 (Pleistocene)	Moderate/low	Moderate
	2.2.32 (Cretaceous)	Moderate/high	Moderate

[a]Formation numbers keyed to Lander, 1985.
Source: Lander, 1985.

Table 3.2.12-2 - Summary of Importance and Amount (miles) of Potentially Fossiliferous Formations and Potential Resources within the 1-mile-wide Pactex Corridor

Location/Importance	Miles	Description (Formation[a])
POLA		
High	0	-
Moderate	(508 acres)	Moderate potential for Pleistocene marine invertebrates and continental and marine vertebrates (2.2.1).
Low	0	-
California		
High	35	High potential for Pleistocene and Pliocene continental vertebrates and Miocene marine vertebrates (2.2.2, .4, .6, .7, and .10)
Moderate	219	Moderate potential for Pleistocene continental vertebrates and Pliocene marine vertebrates and invertebrates (2.2.3, .5, .8, .9, and .11)
Low	0	-
Arizona		
High	29	High potential for Pleistocene and Miocene continental vertebrates (2.2.12 and .15)
Moderate	299	Moderate potential for Pleistocene and Tertiary continental vertebrates and Miocene marine invertebrates (2.2.13 and .16 to .18)
Low	23	-
Southwestern New Mexico		
High	0	-
Moderate	152	Moderate potential for Pleistocene and Tertiary continental vertebrates; high potential for Permian marine invertebrates (2.2.19 to .22).
Low	7	-
West Texas		
High	14	-
Moderate	115	Moderate potential for Pleistocene continental vertebrates, Cretaceous marine vertebrates and invertebrates, and Permian marine vertebrates; high potential for Permian marine invertebrates (2.2.22 to .27).
Low	18	-
Southeastern New Mexico		
High	0	-
Moderate	56	Moderate potential for Pliocene, Miocene, and Triassic continental vertebrates and Cretaceous marine vertebrates; high potential for Cretaceous and Permian marine invertebrates (2.2.28 to .31).
Low	0	-
West-Central Texas		
High	0	-
Moderate	64	Moderate potential for Pleistocene, Pliocene, and Miocene continental vertebrates and Cretaceous marine vertebrates; high potential for Cretaceous marine invertebrates (2.2.31 and .32).
Low	0	-

[a]Formation numbers keyed to Lander, 1985.
Source: Lander, 1985.

Table 3.2.12-3 - List of Recorded Fossil Localities
Within the 1-mile-wide Pactex Corridor

Location[a]	Importance	Number of Localities	Formation[b]	Age[c]	Fossil Type (abundance)
SW-CA	High	2	2.2.2	Ple	Mammal (few)
SW-CA	Medium	1	2.2.3	Pli	Mammal (few)
SW-CA	High	1	2.2.4	Mio	Fish (several)
SW-CA	Medium	4	2.2.5	Ple	Unknown
SC-CA	High	16	2.2.7	Pli	Mammal, plant (many)
SE-CA	Medium	1	2.2.8	Pli	Invertebrate (many)
SE-CA	High	5	2.2.10	Pli-Ple	Mammal (many)
C-AZ	High	6	2.2.15	Mio	Mammal (many)
SW-NM	Medium	1	2.2.21	Ple	Mammal (many)

[a]SW-CA = southwestern California, Los Angeles to Diamond Bar
SC-CA = southcentral California, Diamond Bar to Redlands
SE-CA = southeastern California, Redlands to Colorado River
C-AZ = central Arizona
SW-NM = southwestern New Mexico, Arizona state line to Fort Bliss
[b]Formation numbers keyed to Lander, 1985.
[c]Ple = Pleistocene age
Pli = Pliocene age
Mio = Miocene age
Source: Lander, 1985.

2. South-Central (between Diamond Bar and Redlands). Quaternary alluvial and continental deposits (Formations 2.2.5 and .6) have produced fossil remains, including land mammals, in and near the central segment of the corridor in California (Williams Brothers Environmental Services, 1976; Jefferson, 1985).

3. Southeastern (between Redlands and Colorado River). The Pliocene Formation 2.2.7 has produced numerous, diverse land mammal remains and fossil leaves inside and near the corridor. The marine Formation 2.2.8 contains Pliocene invertebrate fossils inside the corridor. Formation 2.2.10 and overlying Formation 2.2.9 have produced land mammals of Pliocene-Pleistocene and Pleistocene age, respectively. The 2.2.10 fossil localities are in the corridor. To the east, the corridor would cross the flanks of several ranges of hills that contain some Quaternary continental deposits containing mammal remains outside of the corridor (Jefferson, 1985).

C. Arizona

Quaternary deposits exposed east of the Colorado River (Formation 2.2.12; Fugro, 1976) and in several valleys in south-central and southeastern Arizona (Formations 2.2.17, and .18; Lindsay, 1979) have produced land mammal remains near the corridor. A late Pleistocene deposit (Formation 2.2.14; Van Devender, 1978) containing land mammal fossils occurs near the corridor in central Arizona.

Near the Colorado River, the Pleistocene deposits are underlain by the marine Formation 2.2.13, which contains Miocene invertebrate fossils near the corridor. In central Arizona, a Pleistocene formation overlies the Miocene Formation 2.2.15 and an Oligocene formation (Lindsay, 1979). These formations all contain fossil mammal localities near the corridor, although only Formation 2.2.15 also has localities in the corridor.

D. Southwestern New Mexico

Quaternary bolson deposits (Formation 2.2.19) produced late Pleistocene land mammals near the corridor. The Miocene Formation 2.2.20 is known to contain diverse fossil land mammal assemblages outside of the corridor.

E. West Texas and Southeastern New Mexico

Pleistocene deposits (Formation 2.2.21) containing fossil vertebrates are reported from Permian marine limestone in and near the corridor in west Texas (Smartt, 1977). Similar limestone units are exposed in west Texas and in southeastern New Mexico. These units, including Formations 2.2.22, and .24 to .28, have produced many diverse and abundant invertebrate assemblages (Girty, 1908; Cooper and Grant, 1972, 1977; King, 1948; Walter, 1953). Formation 2.2.27 also contains shark and fish remains (Babcock, 1977). Potentially fossiliferous marine Cretaceous deposits (Formation 2.2.23) overlie the Permian rocks in west Texas.

F. Southeastern New Mexico

The continental Formation 2.2.29 is exposed in southeastern New Mexico. Numerous remains of Triassic vertebrates, including shark, fish, amphibian, and reptile, are reported from this unit outside of the corridor (Murry, 1981, 1982, in press).

The Tertiary Formation 2.2.30 has produced diverse upper Miocene and Pliocene land mammal assemblages northeast of the corridor.

G. New Mexico-Texas State Line to Midland, Texas

Quaternary sand deposits (Formation 2.2.31) in west-central Texas have produced diverse mammalian fossils of late Pleistocene age near the corridor (Green, 1961; Wendorf et al., 1955). One fossil locality also contained human remains. The marine Formation 2.2.32 has produced abundant, diverse invertebrate assemblages (Corwin, 1982) and shark remains outside of the corridor.

3.2.13 VISUAL RESOURCES

The existing visual conditions (EVC) from California to Texas were inventoried for proposed aboveground pumping stations and pipeline crossings at major rivers and aqueducts. Table 3.2.13-1 defines the visual conditions used in this EIR/EIS and compares the EVC types with BLM visual management classes. Table 3.2.13-2 defines the proposed locations of the aboveground facilities, describes the existing visual conditions, and indicates the locations from which the facilities would be seen. A detailed description of the existing visual environment along the pipeline route can be found in the SOHIO draft EIS (BLM, 1976, pp. 2-668 to 2-674).

The judgment of visual sensitivity involves consideration of a person's use of and concern for maintaining scenic quality and open space. Examples of visual sensitivity along the proposed pipeline ROW would include areas visible from scenic highways or tourist routes; wilderness or primitive areas; designated or developed parks and recreational areas, resorts, and water bodies; areas experiencing considerable backcountry, recreational vehicle, or camping use; and open space areas among congested, developed tracks. Much of the proposed route would traverse areas of relatively low visual sensitivity.

The following description of visual resources is restricted to the visual corridor of Pactex's proposed project and associated aboveground facilities.

A. POLA to Blythe

The existing visual character of Los Angeles Harbor is that of an industrial harbor area serving a wide range of maritime activities. The terrestrial area of the port has been altered extensively by man's presence and is not as aesthetically pleasing as a natural undeveloped site. Oil pumps, storage tanks, pipelines, exhaust stacks, cranes, water towers, buildings, and other related structures are typical of the area's visual makeup.

Specific regions within the harbor do provide comparatively high aesthetic value. Areas of high visual quality are primarily recreation facilities such as small craft marinas and tourist complexes. The view of boats berthed or sailing through the open water areas of the harbors is aesthetically pleasing to most people and adds significantly to the visual quality of the harbor. The overall scenic quality of the harbor can be described as mixed. The industrial area is of relatively low scenic quality, although it is consistent with the surrounding industrial and commercial visual resources. In contrast, the harbor's open water and recreation areas possess a comparatively high aesthetic value.

From POLA through much of California, the route would transverse areas of existing urban and industrial development or irrigated agricultural cropland. These areas are of low scenic value because of existing visual intrusions (highways, overhead utilities, railroads, and existing pipelines). Within the relatively flat urban landscape, visibility of any potential disturbance of land surface, vegetation pattern, or aboveground pipeline valve would be restricted esentially by buildings and other structures in the immediate area

Table 3.2.13-1 - Definitions of Visual Condition Types and Comparison of BLM Visual Management Classes

Visual Conditions: Existing and Future Type	Visual Conditions: Designation	Description	Visual Similarity to BLM Management Class
I	Untouched landscapes	In wildland landscapes, areas in which only ecological change has taken place, except for trails needed for access. They appear to be untouched by human activities.	I
II	Unnoticed alterations	In wildland, agricultural, or residential-use landscapes, areas in which changes in the landscapes are not visually evident to the average person, unless pointed out. The changes appear to be unnoticed.	II
III	Minor visual disturbances	In wildland, agricultural, or residential-use landscapes, areas in which changes in the landscape are noticed by the average person, but they do not attract attention. The natural appearance of the landscape still remains dominant. The changes appear to be minor disturbances.	III
IV	Visual disturbances	In wildland, agricultural, industrial, or urbanized landscapes, areas in which changes in the landscape are easily noticed by the average person and may attract some attention. The changes appear to be disturbances but resemble natural patterns.	IV
V	Major visual disturbances	In wildland, agricultural, industrial, or urbanized landscapes, areas in which changes in the landscape are strong and would be obvious to the average person. These changes stand out as a dominating impression of the landscape. Yet, in wildland landscapes, the changes are shaped so that they might resemble natural patterns when viewed from a 3-mile or more distance.	IV
VI	Drastic visual disturbances	In wildland, agricultural, industrial, or urbanaized landscapes, areas in which changes in the landscape are in glaring contrast to the natural appearance. In wildland landscapes, almost all people would be displeased with the effect. The changes appear to be drastic disturbances. In agricultural, industrial, or urbanized areas, these changes represent the strongest human domination of the landscape.	V

Sources: BLM, 1980; California Resources Agency, 1979; BLM, 1984a, p. 3-97.

Table 3.2.13-2 - Existing Visual Conditions

Site or Facility	Existing Visual Condition[a]	Description	Visible From
Los Angeles Terminal	V	Breakwater adjacent - warehouses, storage terminals, container terminals, and ship repair yards nearby.	Shoreline, approximately 2 miles
Wilmington Station	VI	In heavy industrial area with oil tanks, oil wells, and industrial plants.	California Highway 1 and Pacific Coast Highway
Rialto Station	V	In industrial area with oil tanks and cement plant.	I-10
Blythe Station	IV	In urban area near radio tower.	I-10
Colorado River Crossing	V	At the south edge of Blythe, near a campground, residences, light industrial facilities, a levee, an overhead suspension bridge for a pipeline, and I-10 and its attendant bridge over the Colorado River.	I-10 bridge and local roads
La Posa Station	IV	In the broad La Posa plain, flat desert near I-10.	I-10
Gila River Crossing	V	In the broad valley of the Gila River with existing pipeline bridges, U.S. 80 bridge, quarries, and Gillespie Dam.	U.S. 80 and the Gillespie Dam in the Arlington State Wildlife Area
Gila Station	IV	On a flat desert landscape with brush cover, an existing pipeline corridor, and nearby cultivated fields.	U.S. 80/U.S. 85
Coolidge Station	IV	On a flat, brush-covered, desert plain with existing roads and pipeline corridors.	U.S. 89/U.S. 85

Table 3.2.13-2 (Contd)

Site or Facility	Existing Visual Condition[a]	Description	Visible From
San Pedro River Crossings	III	A broad, gravel wash framed by desert mountains and canyons with existing roads on both sides of the river.	Not visible from any major travel route or use area
Reddington Station	III	About 4 miles east of San Pedro River with similar views.	Not visible from any major travel route or use area
Lordsburg Station	V	A vast, brush-covered desert plain with an existing pipeline corridor, roads, railroads, and the town of Lordsburg nearby.	I-10
Akela Station	IV	A vast desert with creosote and cacti, an existing pipeline, and communcations corridor with roads and railroads nearby.	I-10
Rio Grande River Crossing	V	In the broad Rio Grande floodplain with existing overhead pipeline crossings, a highway bridge, and roads and agricultural fields on both river banks.	Berino Road
Hueco Station	III	Near Hueco Tanks State Park - existing pipeline corridor.	Not visible from park access road or other highway
Pecos River Crossing	V	Existing pipeline crossings, roads, and nearby compressor station.	Not visible from any major travel route or use area
Jal Station	V	Semidesert with grass, cultivation, and existing pipeline corridor with large oil tanks nearby.	NM 18
Midland Terminal	V	Scrub brush on an industrial area with large oil tanks, pipelines, and steets adjacent.	I-20 and County Roads 307 and 715

[a]See Table 3.2.13-1.
Source: Pactex, 1985.

of the pipeline corridor. Major portions of the proposed pipeline corridor would not be visible from residential areas, public roads, or public parks and recreational areas.

For approximately 35 miles from POLA, the pipeline would follow the Dominguez Channel and the flood control channels of the Los Angeles River, Rio Hondo, and the San Jose Creek. These concrete-lined, channelized watercourses are largely lacking in scenic and natural values. However, these channels do provide open space to the built-up urban nature of the surrounding landscape.

Outside the greater Los Angeles urban landscape, the existing visual environment is of scattered urban and agricultural lands. Rural communities along the pipeline route in San Bernardino and Riverside Counties provide high open-space value. However, numerous urban visual intrusions, including powerlines, residential subdivisions, industrial/commerical areas, and an extensive road grid, would limit the scenic quality of these areas.

The natural landscape from the Beaumont vicinity to Blythe possess a relatively high scenic value. Although much of this corridor traverses fairly monotonous terrain in terms of plant diversity and geologic relief, the aesthetic quality of this section remains greater than the previously traversed urbanized areas. The pipeline corridor along this section would parallel I-10, a scenic and tourist highway. Areas of higher visual sensitivity would include San Gorgonio Pass, Coachella Valley, and the resort community of Palm Springs; Joshua Tree National Monument, a portion of which overlooks the corridor; Orocopia and Chuckwalla Mountains, which experience considerable recreational vehicle use; and the Palo Verde Valley and Colorado river at the California/Arizona border.

B. Blythe, California, to Pine Springs, Texas

Segments of the landscape of relatively high scenic value within the region traversed by the proposed pipeline system would be areas of considerable landform relief, colorful rock outcroppings, mosaics of diverse plant communities, few manmade intrusions, or perennial water features. Much of the proposed pipeline ROW would parallel existing highways and pipelines and would traverse extensive flat, featureless areas with uniform desert brushland or grassland vegetation (BLM, 1984a, p. 3-96). The existing pipeline scar is a significant visual intrusion on open-space values. However, the scenic quality of several segments of the proposed route from Blythe, California, to Pine Springs, Texas, remains moderately high.

For Arizona, areas of visual sensitivity would include the Gila River greenbelt and the Arlington Wildlife Refuge, both areas of high recreational use; scenic highways U.S. Routes 80 and 89 (Pinal Pioneer Parkway) and Arizona 77; the Black Mountain area; the Galiuro Wilderness and the Mt. Lemon recreational area in the Coronado National Forest; and the Dos Cabezas and Peloncillo Mountains. In New Mexico, the foothills of the Peloncillo Mountains and Anthony Gap would be the only areas of significant scenic value traversed by the pipeline. Texas has several areas of visual sensitivity, i.e., Franklin Mountain State Wilderness Park, which encompasses a high,

rugged desert mountain range; Hueco Tanks State Park, a dense cluster of monolithic red sandstone outcroppings; U.S. Route 62/180, a scenic highway; and Guadalupe National Park.

C. Pine Springs to Midland, Texas

The proposed pipeline corridor would cross a broad flat plain with extensive sand dunes near New Mexico and numerous sink holes near Midland. Vegetation is largely desert creosote bush and mesquite lands except for salt cedar thickets near the Pecos River and short-grass prairie in the vicinity of Jal (BLM, 1976, p. 2-685). There is no area of significant scenic value in the path of the proposed pipeline corridor; however, the proposed pipeline corridor would cross an extensive area of open-space values.

3.2.14 NOISE

The environment potentially affected by noise emissions from the Pactex project is described below. The description includes identification of existing noise-sensitive receptors, terrain features, existing noise levels, and major existing noise sources. These existing characteristics are described for the areas surrounding each component of the project: the harbor area, the pump stations, the storage terminals, and the pipeline route.

All noise levels referred to are A-weighted and are measured in units of decibels (dBA). The A-weighted scale is used because it is the most commonly accepted method of combining sound levels of different frequencies in a manner that is similar to the human hearing process.

In addition to the frequency content of noise and the duration of its impact, the variation of noise level over time affects the degree of impact on the community. The variation of noise levels over time can be described by a statistical distribution. An example of a statistical level is the median level that is designated L_{50}, because 50% of the time levels are higher than L_{50} and 50% of the time they are lower. Similarly, L_{10} indicates the level exceeded 10% of the time, and L_{90} is the level exceeded 90% of the time during a measurement period.

Statistical levels such as L_{10} have been used in the past by various agencies to characterize the noise environment and likely responses of a community. At present, however, most Federal, state, and local agencies have adopted what is thought to be a more accurate measure of a community's noise environment, which is based on the energy equivalent sound level or L_{eq}. The L_{eq} is a measure of the average noise energy measured over any given time period. To characterize the noise environment in a community over a 24-hour period, the L_{eq} is computed separately for daytime hours (7 a.m. to 10 p.m.) and nighttime hours (10 p.m. to 7 a.m.). A 10-dBA penalty is added to the nighttime L_{eq} to account for the more sensitive response of communities to sounds at night. The daytime and nighttime levels are then combined to form the average day-night sound level, or L_{dn}. This measure is widely used by agencies to identify the noise impact of projects on communities and is used as an indicator of the existing acoustical environment in the project area as described below.

Ambient noise levels were not measured for this analysis; rather, estimates were based on findings reported in the literature for similar land-use areas. The general relationship between population density and existing average day-night noise levels (L_{dn}) reported in one study is shown in Table 3.2.14-1 (National Research Council, 1977). Another study investigated the relationship between L_{eq} and communities of various types (Wyle Laboratories, 1971). The results of this study indicate that the daytime L_{eq} is, on the average, about 2 dBA below the day-night level, L_{dn}. These findings, which are the most recent reliable data available, have been adopted for the purposes of this report, as shown in Table 3.2.14-1.

Table 3.2.14-1 - Relationship Between Population Density and Average Daytime and Day-Night Noise Levels

Location	Persons/mi^2	Approximate Noise Level	
		Daytime (L_{eq}, dBA)	Day-Night Average (L_{dn}, dBA)
Rural			
Undeveloped	20	33	35
Partially developed	60	38	40
Suburban			
Quiet	200	43	45
Normal	600	48	50
Urban			
Normal	2,000	53	55
Noisy	6,000	58	60
Very noisy	20,000	63	65

Sources: Adapted from National Research Council, 1977; and Wyle Laboratories, 1971.

A. Harbor Area

The nearest potentially sensitive land use in the harbor area is the residential areas in San Pedro and the Long Beach Naval Station, located about 2 miles from the proposed Pactex berthing facility. Navy facilities located closer than this distance would not be as sensitive to construction activity as are the residences. The San Pedro residential area includes schools, playgrounds, and open space recreational areas including Cabrillo Beach Park, the Fifteenth Street School, and the Anderson Memorial Playground. The area is already exposed to the sound produced from existing harbor activities particularly in the Main Channel of the Los Angeles Harbor, which lies less than 0.25 mile from the nearest residences. Major collector roads and existing commercial and industrial activity on Terminal Island and along Harbor Boulevard also add to the present noise environment.

The predominant wind direction in the harbor area when wind speeds are moderate or high (above 7 knots) is from the southwest (Pactex, 1985). At lower wind speeds, the wind is distributed in many directions. The effect on residences near the proposed facility is a reduction in the normal propagation of noise from the berth to the residences because wind is often blowing from the residences toward the facility.

The San Pedro residential area is on a hill overlooking the harbor. Many homes would have a direct line of sight to the berthing area during its construction and operation. This terrain feature would act to increase noise levels compared to normal circumstances when propagation is attenuated as it travels over intervening obstacles.

As shown in Table 3.2.14-2, in the suburban/industrial border environment along Harbor Boulevard, it is estimated that the nearest receptors to the proposed berthing facility are presently exposed to an average daytime noise level (L_{eq}) of about 63 dBA and an average day-night noise level (L_{dn}) of about 65 dBA (National Research Council, 1977; Wyle Laboratories, 1971).

B. Pump Stations

Based on an assessment of the environment surrounding each of the proposed pump stations, the existing average equivalent daytime and day-night sound levels at the nearest potentially noise-sensitive receptor at each station are estimated as shown in Table 3.2.14-2.

The pump station and interim liquid storage tank farm in Wilmington would be located in a highly industrialized area between the cities of Wilmington and Long Beach. The facility would be bordered by the Dominguez Drainage Channel, Union Carbide plant facilities, and other industrial land uses. The nearest potentially sensitive receptors are approximately 0.75 mile from the site in two directions. To the east are some homes and a school (Field School) in Long Beach that are within 1,000 ft of the Terminal Island Freeway that lies between the proposed pump station and the homes. The typical L_{dn} for this type of land-use area is about 65 dBA (National Research Council, 1977; Wyle Laboratories, 1971). To the west are homes and a school (Wilmington Park School) in the Wilmington residential area, bordered by Alameda Boulevard, which is a major arterial, the Southern Pacific Railroad, an oil refinery, automotive junkyards, and other industrial land uses. The L_{dn} in this area is also estimated to be about 65 dBA (National Research Council, 1977; Wyle Laboratories, 1971).

Of the 10 other pumping stations, two would be located in suburban/rural settings (Rialto and Blythe), and the remainder would be located in open space rural environments. Depending on the exact location of receptors near the Lordsburg Station, noise levels could be slightly higher than the values shown if they are situated close to I-10.

C. Storage Terminal - Midland, Texas

The existing environment in the vicinity of the Midland terminal is typical of a small rural town. The terminal would be located on the southeast edge of the town, approximately 1 mile from the intersection of State Route 158 and U.S. 80 at the town center. The terminal would be located just north of I-20 on County Road 307 at a site previously used as an oil terminal. Surrounding the proposed terminal are other existing oil tank farms, related facilities, and open space. No commercial or residential land uses are located in the immediate vicinity.

Table 3.2.14-2 - Existing Noise Levels Near Harbor, Pump Stations, and Storage Terminal

Location	Receptor	Distance from Pipeline to Receptor (ft)	Estimated Existing Noise Level	
			Daytime (L_{eq}, dBA)	Day-Night Average (L_{dn}, dBA)
Harbor				
San Pedro	Residences	2	63	65
	Fifteenth Street School	2	63	65
Pump Stations				
Wilmington	Residences	0.75	63	65
	Wilmington Park School	0.75	63	65
	Residences - Long Beach	0.75	63	65
	Field School	0.75	63	65
Rialto, California	Residences	1	53	55
Blythe, California	Residences	4	43	45
Livingston, Arizona	Residences	30	43	45
Gila, Arizona	Residences	10	38	40
Coolidge, Arizona	Residences	20	43	45
Redington, Arizona	Residences	25	48	50
Lordsburg, New Mexico	Residences	100	38	40
Akela, New Mexico	Residences	20	43	45
Hueco, Texas	Residences	17	43	45
Jal, New Mexico	Residences	4	38	40
Terminal				
Midland, Texas	Residences	1	48	50

Source: Adapted from National Research Council, 1977; Wyle Laboratories, 1971.

Based on this information and data presented in previous studies (BLM, 1976), the estimated existing ambient day-night noise level at the nearest residence is 55 dBA.

D. Pipeline Route

The existing noise environment along the pipeline route varies widely from noisy urban conditions in the Los Angeles metropolitan area to extremely quiet and undisturbed conditions in the deserts of Arizona and New Mexico.

A list of potentially sensitive receptors identified along the route is included in Table 3.2.14-3. The table shows that existing day-night noise levels range from 65 dBA in the Los Angeles metropolitan area to 45 dBA in remote rural areas. The California Country Club, located in the City of Industry alongside a major freeway, is an exception, with an existing ambient level estimated to be 75 dBA. Receptors located more than 1 mile from the pipeline are not listed in the table. Where more than one residential area may be affected by the pipeline, the shortest distance to the pipeline is shown.

Table 3.2.14-3 - Existing Noise Levels Along Pipeline Route

Location	Receptor	Distance from Pipeline to Receptor (ft)	Estimated Existing Noise Level	
			Daytime (L_{eq}, dBA)	Day-Night Average (L_{dn}, dBA)
North Long Beach	Union and Sutter Schools	250	63	65
	Residences	250	63	65
Paramount	Dominguez High School	250	63	65
	Residences	250	63	65
South Gate	Residences	250	58	60
	Los Padrinos Juvenile Hall	1,250	58	60
Pico Rivera	John A. Ford Park	500	58	60
	Rio Hondo Country Club	100	58	60
	Residences	100	58	60
	St. Vincent's Seminary	1,500	53	55
	Rio Hondo Park	500	53	55
Montebello	Park	750	53	55
	Residences	750	53	55
	Pio Pico School	1,500	53	55

Table 3.2.14-3 (Contd)

Location	Receptor	Distance from Pipeline to Receptor (ft)	Estimated Existing Noise Level	
			Daytime (L_{eq}, dBA)	Day-Night Average (L_{dn}, dBA)
City of Industry	Residences	250	53	55
	Wildlife sanctuary and park	2,750	53	55
	Equestrian area	750	58	60
	California Country Club	500	73	75
	Latin American Bible Institute	750	58	60
Walnut	Walnut School	750	53	55
	Residences	5,000	48	50
Chino	California Institute for Men	3,000	48	50
	Hawthorne Christian School	400	58	60
	Residences	200	48	50
Fontana	Fontana Bird Park	2,000	43	45
Crestmore	Crestmore School	1,500	48	50
	Park	1,500	48	50
	Residences	250	48	50
Loma Linda	Union Academy	1,000	53	55
	Hospital	500	48	50
	Loma Linda University	500	48	50
	Community Hospital	300	48	50
	Bryn Mawr	750	43	45
	Residences	250	48	50
Banning	Residences	500	48	50
Desert Center	Residences, School	1,000	43	45
Blythe	Residences	2,500	43	45
Midland	Residences	5,000	48	50

Source: Adapted from National Research Council, 1977; Wyle Laboratories, 1971.

3.2.15 OCEANOGRAPHY AND MARINE BIOLOGY

The Los Angeles Harbor, located in the San Pedro Bay, is a southern extension of the relatively flat coastal plain bounded on the west by the dominant Palos Verdes Hills. The hills are a structural block forming a stubby peninsula that offers some protection to the bay from prevailing westerly winds and currents. Originally, San Pedro was an estuary of the Los Angeles River with additional freshwater flow from the San Gabriel River. Development of the Los Angeles and Long Beach Harbor complex through dredging, filling, and channelization over the past 80 to 100 years has completely altered the local estuarine physiography. The natural mudflats and marshlands may well have created habitats for birds, fishes, mollusks, and worms, and they may also have formed anaerobic sludge that gave off methane gas and hydrogen sulfide. The Los Angeles River course and the harbor areas are no longer true estuaries because they do not maintain significant year-round freshwater input. Salinity gradients are transitory, therefore, the biota are not distributed along gradients as in most estuarine systems. Marine populations of plankton, settling and fouling organisms, fishes, and birds are associated with the harbor complex.

The marine biological environment of the harbor and bay complex is determined by the synergy of the geography, geology, and oceanography of the area. Where possible, discussion of the marine biology is carried out in relation to the habitats determined by these characteristics and the following harbor configuration zones:

(1) Inner harbor - areas north of the Vincent Thomas Bridge.

(2) Main Channel - areas south of the Vincent Thomas Bridge to Reservation Point.

(3) Outer harbor - areas south of Reservation Point to the San Pedro, Middle, and Long Beach breakwaters.

Appendix I provides supplemental reference data.

A. Physical Oceanography of the Harbor

1. Tides. Sea level variations are the result of astronomical and fluctuating meteorological conditions. Tidal variations along the coast of Southern California are caused by the passage of two harmonic tide waves, one with a period of 12.5 hours and the other, 25 hours. This combination of two harmonic tide waves usually produces two high and two low tides each day. The semidiurnal tide of 12.5 hours predominates over the diurnal tide of 25 hours in Los Angeles Harbor, generating a diurnal inequality or mixed, semidiurnal tide. This fluctuation relates to the difference in height between successive high and low waters. Generally, the diurnal inequality causes a slight difference between one high water and low water of the day and a marked difference between the other high and low water.

The mean tidal range (between all highs and lows) for the Los Angeles-Long Beach outer harbor is 3.76 ft, and the mean diurnal range is approximately 5.6 ft (COE, 1984d, p. A-1-40). The extreme tidal range is about 10.5 ft; the highest and lowest tides reported are 7.96 ft above MLLW and -2.56 ft below MLLW (MLLW equals 2.8 ft below mean sea level) (COE, 1984d, p. A-1-40).

Available tide data from 1923 to 1984 used at Los Angeles Harbor indicates that the highest water elevations usually occur during the winter months (November to March). This is the same period in which the more severe offshore storms usually occur along the California coast. These higher water elevations typically range from +7 to +7.5 ft MLLW.

2. Waves. The waves at Los Angeles can be divided into three primary categories according to origin: northern hemisphere swell, southern hemisphere swell, and seas generated by local winds.

Los Angeles is directly exposed to ocean swells entering from two main windows. The more severe waves from extratropical storms (Japanese-Aleutian and Hawaiian storms) enter from the south to southeast. The Channel Islands and Santa Catalina Island provide some sheltering of these larger waves depending on the approach direction. The other major exposure window opens to the south, allowing swells to enter from Southern Hemisphere storms, tropical storms (Chubascos), and southerly waves from extratropical storms.

Northern hemisphere swells are predominantly from the west; they occur primarily during the months of November through April. Most of the wave energy reaching Southern California is attributed to swells generated by Japanese-Aleutian originated extratropical storms. Deepwater significant wave heights have ranged up to 20 ft but are typically less than 12 ft. Wave periods typically range from 12 to 18 seconds. Hawaiian storms occur infrequently but could produce swells as large as those produced by Japanese-Aleutian storms. Swells from typhoons in the western North Pacific are usually insignificant by the time they reach the southern California coast. Chubascos developing off the west coast of Mexico rarely travel as far north as southern California.

Southern hemisphere swells characteristically have low heights and long periods. Most of these swells arrive during the months of May through October. Typical southern hemisphere swells rarely exceed 4 ft in height in deep water; however, with periods ranging up to 18 and 21 seconds, they can break at over twice the deepwater wave height.

Locally generated seas are predominantly from the west and southwest; however, these locally generated seas, including waves generated by diurnal sea breezes, can occur from all offshore directions throughout the year. Waves are usually less than 6 ft in height with wave periods less than 10 seconds.

A preliminary analysis was performed to determine local wave climate in the area of the proposed Pactex oil terminal (Pactex, 1985). Significant wave heights for design of structures at the terminal were calculated by considering the effects of the offshore islands (wave exposure), refraction,

shoaling, and diffraction of deepwater waves. The deepwater waves that were sheltered by the offshore islands and land masses were either eliminated or reduced in height, depending on their direction or approach to the Pactex terminal site.

Once the wave entered the harbor, it was assumed that only diffraction effects would occur. Local wave heights were determined for two locations along the south side of the terminal as shown in Figure 3.2.15-1. A summary of wave heights for 10-, 25-, and 50-year recurrence intervals at the two locations is given in Table 3.2.15-1. The two proposed berths would be located at the 75-ft MLLW depth contour. A maximum wave height of 12.4 ft was calculated for the southwest corner of the island. This is a worst-case design wave; Table 3.2.15-1 shows a reduction in calculated wave height along the southern border of the island and along a west to east transect.

Table 3.2.15-1 - Waves at Proposed Pactex Berths

Recurrence Interval (year)	Wave Height at Locations (ft)	
	A	B
10	4.5	3.4
25	8.5	6.1
50	12.4	8.0

Source: Pactex, 1985.

Another type of wave occurring in the harbor (i.e., the seiche or standing wave) has periods of from 30 seconds to more than 1 hour (COE, 1984d, p. A-1-195). The tsunamis (most often associated with submarine or volcanic disturbances) and storm surges may cause oscillations or seiching in the harbor. Oscillation of the harbor may be at one or more of its harmonic frequencies or at the frequency of the long period wave-train exciting it. Tsunamis entering the Los Angeles Harbor have never been more than a few feet in height, but such wave heights tend to magnify inside the harbor because of their resonance. Vertical water motion in the Los Angeles Harbor on such occasions has been small but large horizontal velocities have been noticed. A 1974 Flood Insurance Study conducted by the U.S. Army Engineer Waterways Experiment Station determined that the 100-year and 500-year runup in Los Angeles area due to tsunamis of distant origin is 5.3 ft and 8.2 ft above MLLW, respectively. Velocities as high as 16 knots were estimated in the Main Channel during the 1960 Chilean Tsunami (COE-L.A. Harbor Department, 1980, p. 22). Besides the Chilean and Alaskan earthquake-generated tsunami effects in the harbor, other significant oscillations have been observed in 1902, 1917, 1924, 1946, and 1968. Regular seiching or resonance, unrelated to

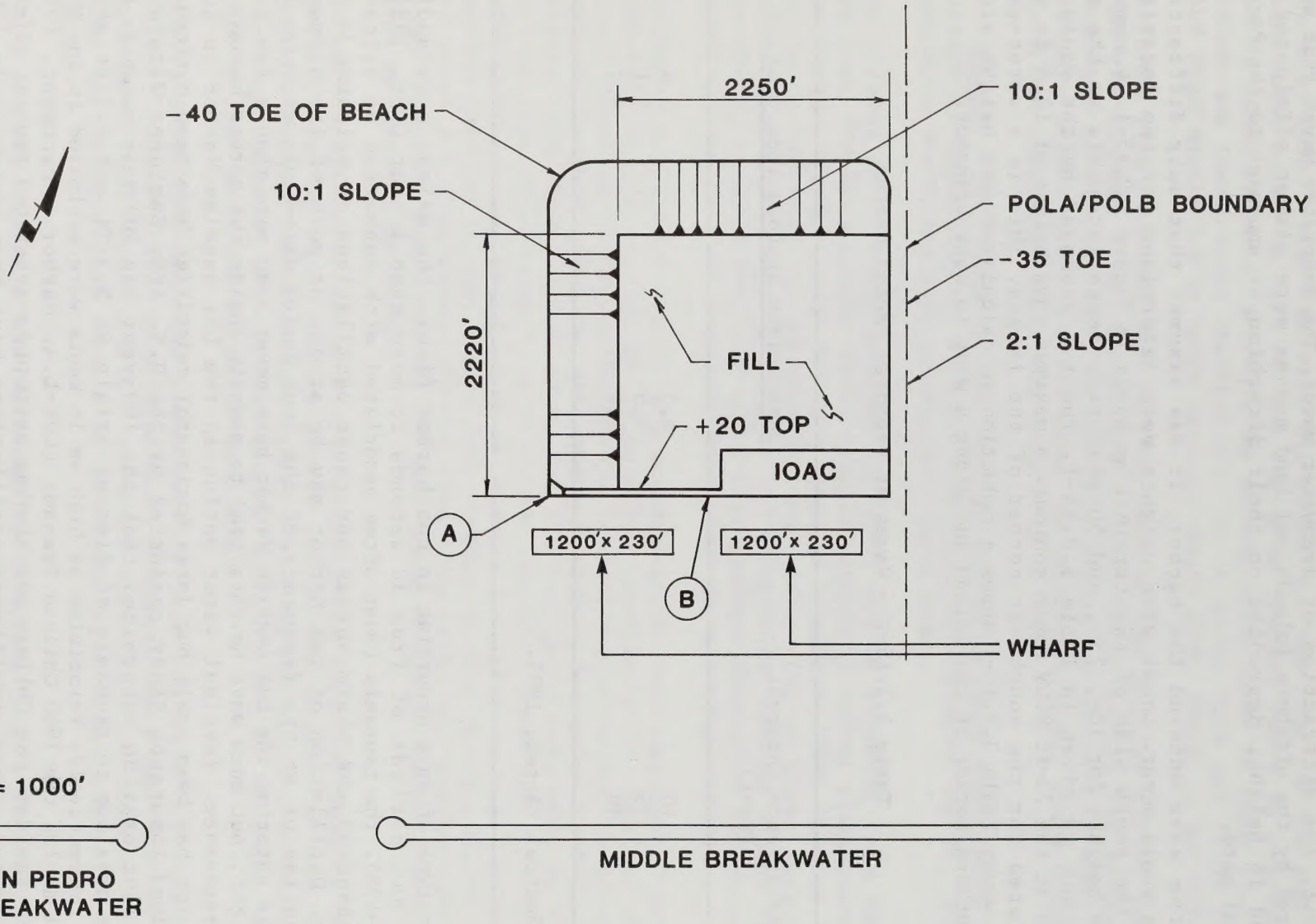


Figure 3.2.15-1 - Locations along Proposed Landfill Island used for Design Wave Calculations (Not to Scale) (Pactex, 1985)

tsunamis, occurs in the harbor at 1.25-hour intervals. It has been estimated that as much as 5% of the total tidal exchange in the harbor can be attributed to seiching (COE and L.A. Harbor Department, 1980, p. 22).

3. Circulation and Flushing. Current speeds, circulation patterns, and flushing rates in the Los Angeles-Long Beach Harbors studied in various investigations have been summarized elsewhere (COE, 1984d, p. D-1-153) and are discussed here. Flood tides in the Los Angeles-Long Beach Harbors flow into the harbor and up the channels, while ebb tides flow down the channels and out of the harbor. During these ebb and flood tide conditions, surface current velocities reach a maximum of approximately 1.0 ft/sec during spring tides, 0.6 ft/sec during mean tides, and less than 0.5 ft/sec during neap tides. Maximum surface tidal velocities of approximately 1.0 ft/sec occur in the outer harbor, near Angel's and Queen's Gates, while minimum tidal velocities of 0.078 to 0.46 ft/sec occur in the inner harbor. Circulation patterns in the Los Angeles-Long Beach Harbors are established and maintained by tidal currents. Figures 3.2.15-2, -3, and -4 depict tidally generated circulation patterns and approximate current velocities in the harbor during spring, mean, and neap tides. These figures represent circulation patterns predicted by modeling studies that simulated actual tidal conditions in the harbor. Tidally generated circulation patterns in the harbor include a large clockwise gyre between Terminal Island and the middle breakwater. The gyre is aided by the presence of a large wind eddy in the same region (COE-LAHD, 1980, p.20). During periods of strong flood tides, the gyre is interrupted south of Reservation Point toward the main channel and Cabrillo Beach (COE-LAHD, 1980, p.20). Smaller counterclockwise gyres exist near Queen's Gate in Long Beach Harbor and near Cabrillo Beach in Los Angeles Harbor. In addition to those outer harbor gyres, a series of opposing gyres and eddies exist in the basin east of Pier J in Long Beach Harbor (COE, 1984d, p. A-1-153; e, Appendix D). These gyres tend to prolong the residence time of water in the harbor.

As a result of tidal flux in the inner harbor, mixing is less than in the outer harbor. The degree of mixing is minimized in the inner harbor in parts of the West Basin, Slips 1 and 5, and Consolidated Slip in POLA, as well as in Channels 2 and 3 in the Port of Long Beach. Currents in the harbor generated during spring, mean, and neap tides are similar. The site of the proposed landfill island is situated within the large clockwise gyre between Terminal Island and the middle breakwater.

Unlike the current, the magnitude of water movement in the harbor is very different during the three types of tides. Table 3.2.15-2 presents the average ebb and flood flow volumes in million cubic feet. For the nine stations shown in Figure 3.2.15-5, the average tidal flow volumes in the harbor reflect the characteristics demonstrated by circulation and tidal velocity studies. The tidal flow rates in the harbor vary as a function of the type of tide (spring, mean, or neap) and by location.

The highest tidal flow volumes shown in Table 3.2.15-2 occur at Angel's and Queen's Gates and east of the Port of Long Beach and Oil Island Freeman. These correspond to Stations 1, 2, and 3, respectively, in Figure 3.2.15-5.

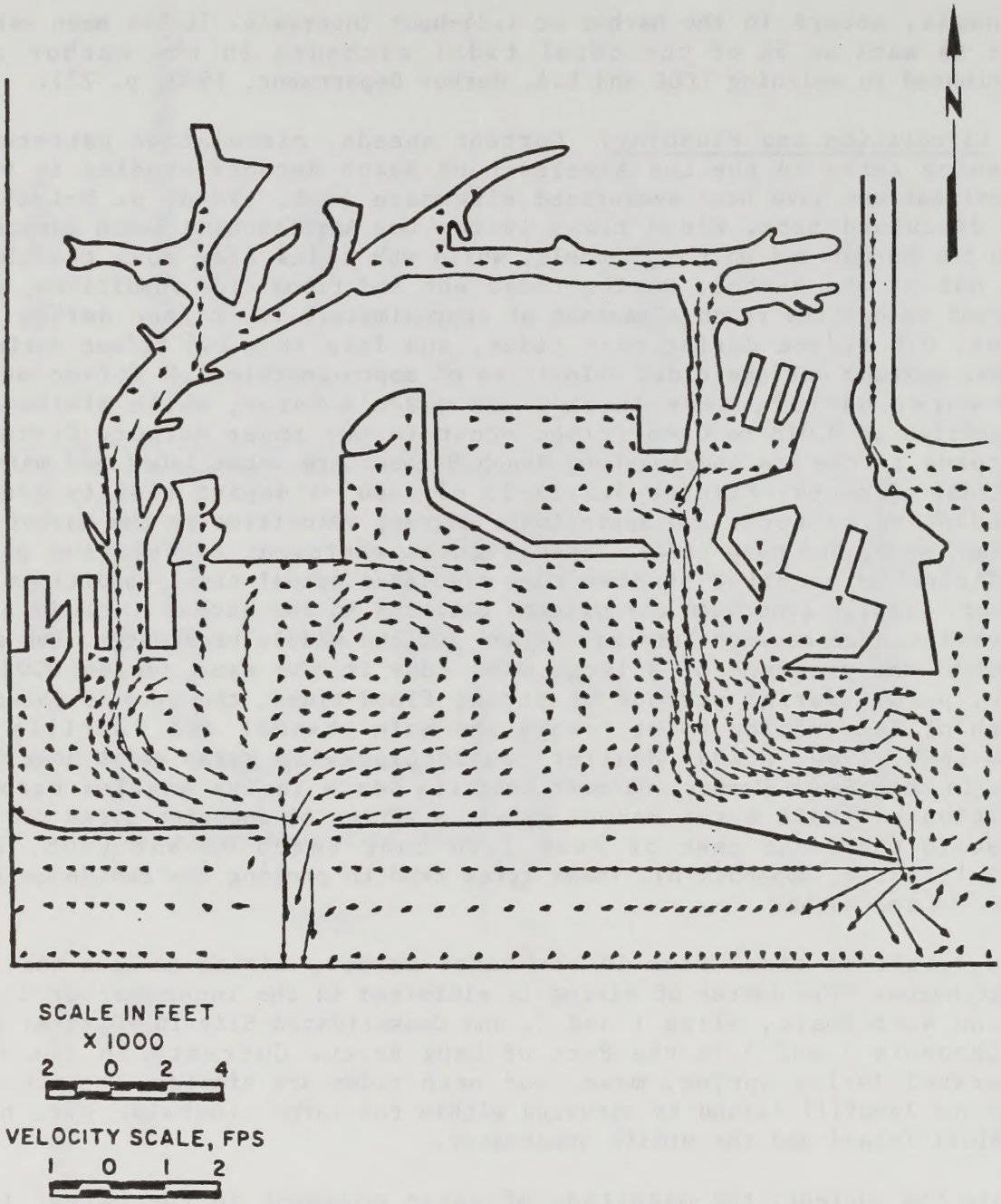


Figure 3.2.15-2 - Spring Tide: Velocity Vector Plots of Tidal Circulation
(existing conditions, hour 60)
(COE, 1984d, Plate 83)

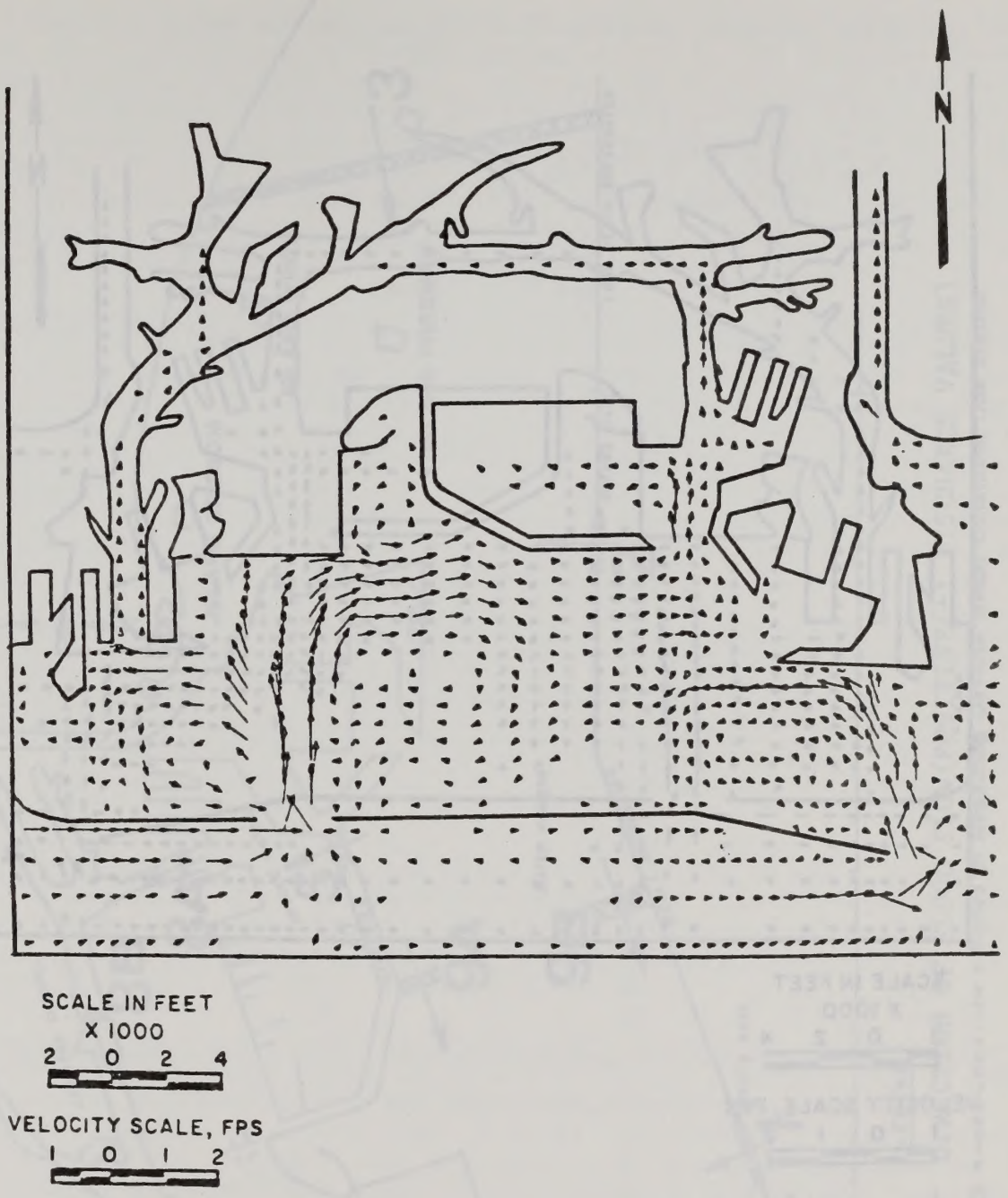


Figure 3.2.15-3 - Mean Tide: Velocity Vector Plots of Tidal Circulation
(existing conditions, hour 60)
(COE, 1984d, Plate 89)

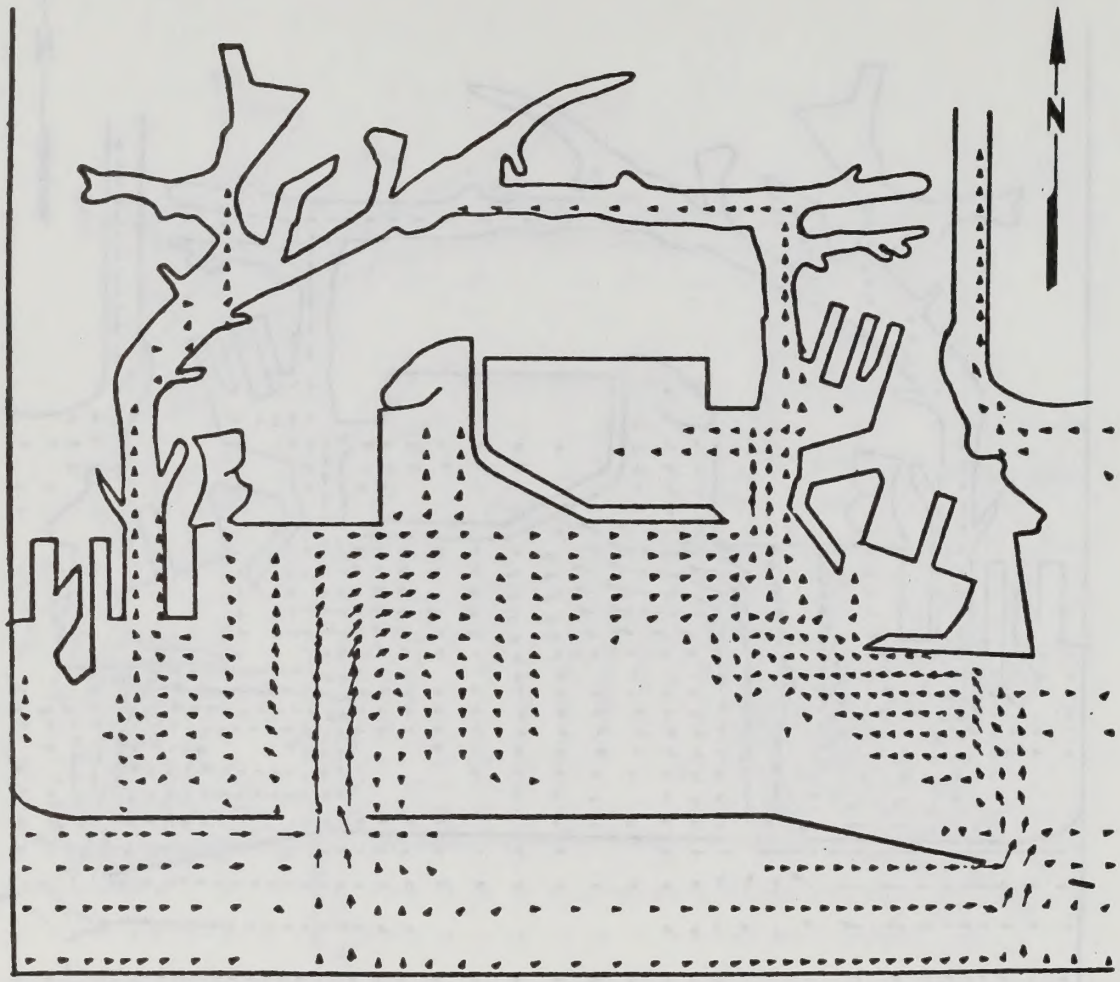


Figure 3.2.15-4 - Neap Tide: Velocity Vector Plots of Tidal Circulation
(existing conditions, hour 60)
(COE, 1984d, Plate 93)

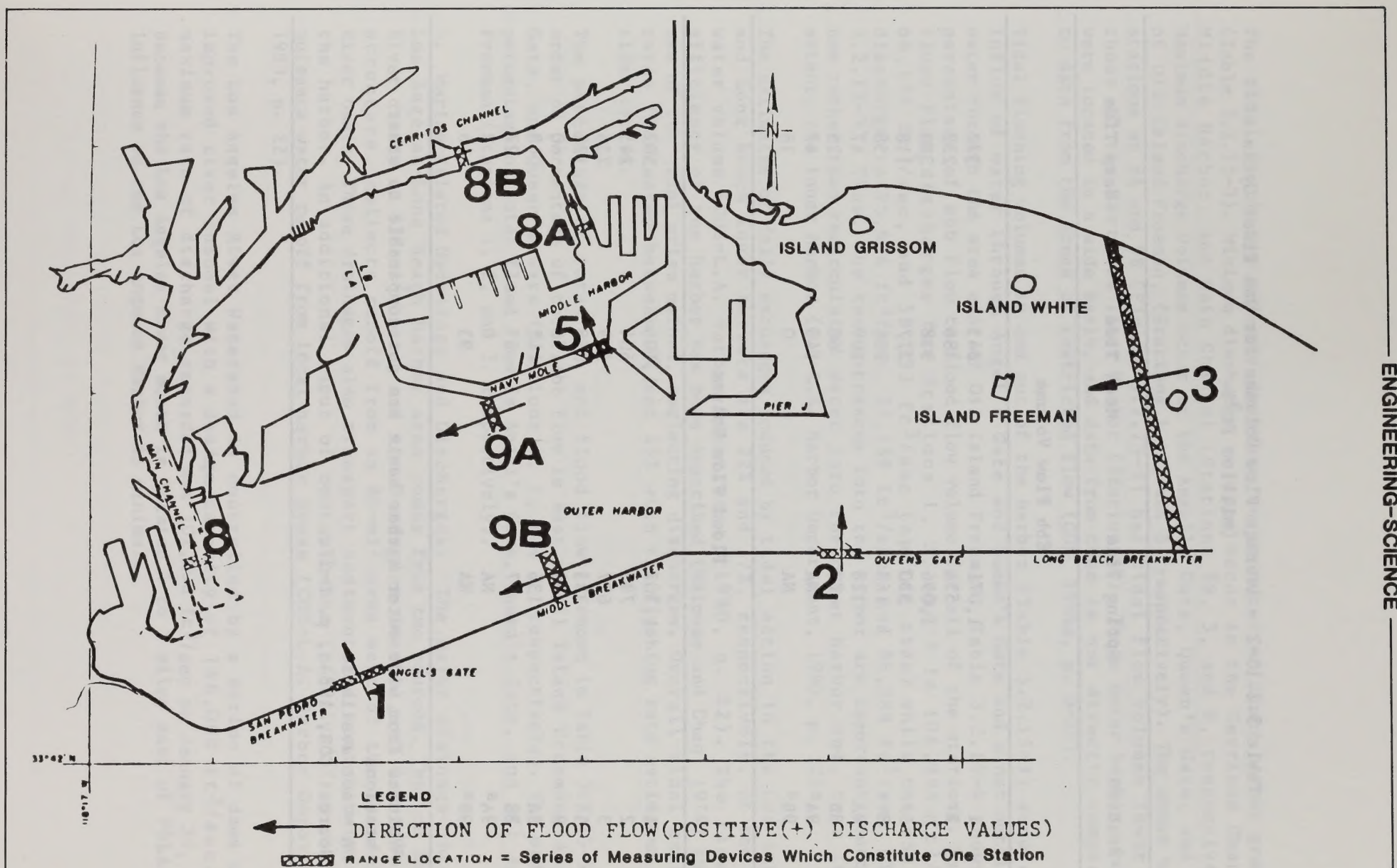


Figure 3.2.15-5 - Location of Discharge and Flow Volume Ranges
(COE, 1984d, p. D-17)

Table 3.2.15-2 - Average Flow Volumes for One Tidal Cycle (million ft^3)

Station	Spring Tide	Mean Tide	Neap Tide
	Ebb Flow Volume		
1	1,071	843	372
2	536	486	232
3	1,096	918	388
5	330	277	118
8	168	138	58
8A	128	109	47
8B	70	60	26
9A[a]	NA	145	47
9B[a]	NA	0	16
	Flood Flow Volume		
1	1,307	1,106	502
2	793	604	245
3	677	569	226
5	335	278	122
8	159	136	60
8A	136	112	48
8B	77	63	27
9A[a]	NA	0	2
9B[a]	NA	93	16

[a]Volumes from wide outer harbor basin are not comparable to other stations.
NA = not available.
Source: COE, 1984d, p. D-37.

The tidal discharge volumes decrease on an outer to inner harbor gradient (Table 3.2.15-3). Minimum discharge volumes occur in the Cerritos Channel, Middle Harbor, and Main Channel (Stations 8B, 5, and 8, respectively). Maximum discharge volumes occur at the Angel's Gate, Queen's Gate, and east of Oil Island Freeman, (Stations 1, 2, and 3, respectively). The outer harbor stations at 9A and 9B (Figure 3.2.15-5) had tidal flow volumes lower than those of the Cerritos Inner Harbor (Station 8B). These outer harbor stations were located in a wide basin, and data from them is not directly comparable to data from the areas of restricted flow (COE, 1984d, p. D-25).

Tidal flushing volumes in and out of the harbor (Table 3.2.15-3) show a net influx of water through Angel's Gate and Queen's Gate and a net outflow of water through the area east of Oil Island Freeman. Table 3.2.15-4 shows the percentage of ebb flow to flood flow volume for all of the stations. Maximum flood flow discharges for Stations 1, 2, and 3 is 106,994 ft^3/sec, 68,194 ft^3/sec, and 58,333 ft^3/sec (spring tide) while the ebb flow discharge is 95,694 ft^3/sec, 55,139 ft^3/sec, and 86,389 ft^3/sec (Table 3.2.15-3). Thus, the two entrances into the harbor are important sources of new rather than recirculated water into the outer harbor and, to a lesser extent, the inner harbor (COE-L.A. Harbor Department, 1980, p. 22).

The estimates of daily exchanges induced by tidal action in the Los Angeles and Long Beach inner harbors are 22% and 17%, respectively, of the total water volume (COE-L.A. Harbor Department, 1980, p. 22). The flushing efficiency of the harbor has been described (Maloney and Chan, 1974) through use of the tidal prism method, neglecting discharges. Overall tidal exchange rates fluctuated between 8% and 25% with the flushing rate estimated at 90 tidal cycles.

The percentage of total ebb and flood flow is shown in Table 3.2.15-5. The order of percentage of total ebb flow is east of Oil Island Freeman, Angel's Gate, and Queen's Gate (Stations 3, 1, and 2, respectively). The order of percentage of total flood flow is Angel's Gate, Queen's Gate, and Oil Island Freeman (Stations 1, 2, and 3, respectively).

4. Marine-Related Hydrology and Discharges. The major drainage into the Los Angeles-Long Beach Harbor area comes from two sources. The Los Angeles River drains an 832-mi^2 basin, and the Dominguez Channel, an 8.5-mile-long structure, collects runoff from an 80-mi^2 area west of the Los Angeles River basin. These drainages also transport sediment and contaminants into the harbor. An additional input of contaminants is derived from storm and nuisance water runoff from local harbor areas (COE-L.A. Harbor Department, 1980, p. 22).

The Los Angeles River Watershed is controlled by a series of dams and an improved river channel with a design capacity of 146,000 ft^3/sec. The maximum rate of discharge recorded was 102,000 ft^3/sec on January 25, 1969. Because the Los Angeles River mouth is located 4 to 5 miles east of POLA, its influence on the Los Angeles Harbor is minimal.

Table 3.2.15-3 - Maximum Ebb and Flood Tidal Discharges (ft^3/sec)

Station	Spring Tide	Mean Tide	Neap Tide
	Ebb Flow Discharge		
1	95,694	75,833	51,528
2	55,139	45,833	30,694
3	86,389	70,139	45,278
5	29,167	19,444	15,278
8	14,861	11,903	7,292
8A	11,347	9,097	5,944
9A	NA	5,944	2,083
9B	NA	671	1,444
	Flood Flow Discharge		
1	106,944	85,139	38,889
2	68,194	45,139	21,528
3	58,333	48,194	28,056
5	27,778	23,333	10,819
8	12,764	10,931	5,833
8A	11,375	9,139	4,722
8B	6,389	5,167	2,792
9A	NA	919	832
9B	NA	5,792	1,282

NA = not available.
Source: COE, 1984d, p. D-37.

Table 3.2.15-4 - Ratio of Flood Flow Volume (%) to Ebb Flow Volume (%)

Station	Spring Tide	Mean Tide	Neap Tide
1	56.2/43.8	56.8/43.2	57.2/42.8
2	59.7/40.3	55.4/44.6	51.1/48.9
3	38.2/61.8	38.3/61.7	35.5/64.5
5	50.4/49.6	50.2/49.8	50.2/49.8
8	48.6/51.4	49.5/50.5	50.0/50.0
8A	51.4/48.6	50.6/49.4	50.0/50.0
8B	52.6/48.4	51.0/49.0	50.0/50.0
9A	NA	0.0/100.0	48.9/51.1
9B	NA	100.0/00.0	48.4/51.6

NA = not available.
Source: COE, 1984d, p. D-40.

Table 3.2.15-5 - Ebb and Flood Flow (%)

Station	Spring Tide	Mean Tide	Neap Tide
	Ebb Flow		
1	39.6	37.5	36.9
2	19.8	21.6	23.0
3	40.6	40.9	40.1
Total	100.0	100.0	100.0
	Flood Flow		
1	47.1	48.5	51.6
2	28.6	26.5	25.2
3	24.3	25.0	23.2
Total	100.0	100.0	100.0

Source: COE, 1984d, p. D-24.

The Dominguez Channel does not transport a significant amount of sediment into the harbor. Freshwater enters the channel only during storms. Until recently, many industries discharged primarily untreated wastes into the channel. At that time, the polluted effluents entered the channel at a rate of about 11 mgd and were a major source of pollution in the harbor. This discharge of untreated industrial wastes has been greatly reduced, and the harbor's water quality has improved significantly.

Wastewater discharges are regulated by the RWQCB, Los Angeles Region. Discharge permits are issued to stipulate the maximum allowable discharge from individual sources. A list of discharge sources and maximum allowable discharge rates is presented in Table 3.2.15-6. No data is available for average discharge rates.

Table 3.2.15-6 - Los Angeles-Long Beach Harbors: Discharge Sources

Discharger	Type[a]	Waste Maximum Quantity (gal/day x 10^3)[b]	Receiving Water
Chevron Chemical Co.	F	50	Inner Harbor
Chevron U.S.A., Inc.	I	250	West Basin
Champlin Petroleum	NA	23,775	Los Angeles Harbor-Cerritos Channel consolidated slip
Champlin Petroleum	NA	172.3	Marine terminal Berth 164
Defense Logistics Agency	NA	288	Los Angeles Harbor
GATX Tank Storage Terminals	I	1,000	Los Angeles Harbor
GATX Terminals Corp.	F	50	Los Angeles Harbor
Harbors Reseach Laboratory (USC)	I	86	Inner Harbor
Korody-Colyer Services, Inc.	E	0.8	Inner Harbor
Los Angeles City, Department of Public Works (Terminal Island Treatment Plant)	A	17,175	Outer Harbor

Table 3.2.15-6 (Contd)

Discharger	Type[a]	Waste Maximum Quantity (gal/day x 10^3)[b]	Receiving Water
Los Angeles City, Department of Public Works[c]	I	NA	Los Angeles Harbor
Los Angeles City, Department of Water and Power (Harbor Generating Station)	B	399,880	West Basin
Los Angeles City, Department of Water and Power (Harbor Steam Plant)	F	40	Inner Harbor
Los Angeles City, Department of Water and Power (Skim Pond, Skim Tank)	NA	46	Inner Harbor
Los Angeles City, Department of Water and Power (Marine Tank Farm, Harbor Steam Plant)	F	50	Inner Harbor
Los Angeles County Flood Control[c]	I	NA	East and West Basin
Los Angeles County Flood Control[c]	I	NA	East Basin
Martin Marietta Carbon, Inc.	NA	NA	Los Angeles-Cerritos Channel
Metropolitan Water District (Palos Verdes Reservoir)	I	760	Inner Harbor
Mobil Oil Corp.	NA	14	Los Angeles Harbor
Mortimer and Wallace, Inc.	E	0.8	Inner Harbor
National Metal and Steel Corp.	B	42	Inner Harbor
North American Trading, Inc.	NA	NA	Los Angeles Fish Harbor
Pan Pacific Fisheries (Plant 3)	E	91	Inner Harbor

Table 3.2.15-6 (Contd)

Discharger	Type[a]	Waste Maximum Quantity (gal/day x 10^3)[b]	Receiving Water
Pan Pacific Fisheries (Plants 1 and 2)	I+F	1,260	Inner Fish Harbor
Pan Pacific Fisheries (Plant 4)	I	1,106	Outer Harbor
River Banks Bulkwater	I	39	Los Angeles Harbor
San Pedro Marine, Inc.	F	4.5	Inner Harbor
Shell Oil Co.	I	104	Inner Harbor
Star-Kist Foods (Plant 1)	I+E	2,637.9	Outer Fish Harbor
Star-Kist Foods (Plant 4)	I+E	16,710	Inner and Fish Harbors
Todd Shipyard Corp.[c]	I	NA	Inner Harbor
Union Oil Co. - Los Angeles Refinery	I	46,125	Inner Harbor
U.S. Borax and Chemical Corp.	I	1,800	Inner Harbor
Western Fuel Oil Co.	F	90	West Basin
AiResearch Manufacturing Co.	NA	100	Dominguez Channel
Air Products and Chemicals	B	47.4	Dominguez Channel
American Raking Equipment	NA	5	Dominguez Channel
ARCO (Watson Refinery)	I	370	Dominguez Channel
Borden Chemicals	F	70	Dominguez Channel
Coastal Sulpur, Inc.	NA	NA	Dominguez Channel
Control Data Corporation	E	0.3	Dominguez Channel
Douglas Aircraft	NA	8.9	Dominguez Channel

Table 3.2.15-6 (Contd)

Discharger	Type[a]	Waste Maximum Quantity (gal/day x 10^3)[b]	Receiving Water
Douglas Aircraft	NA	1.3	Dominguez Channel
Edoco Technical Products	I	30	Dominguez Channel
Gardena Department or Recreation and Parks	NA	1	Dominguez Channel
GATX Tank Storage Terminals	F	228	Dominguez Channel
Golden Eagle Refining Co.	F	995.6	Dominguez Channel
Green's Ready Mix Concrete	F	5	Dominguez Channel
HITCO	NA	NA	Dominguez Channel
Hyatt Corp.	E	5	Dominguez Channel
Los Angeles City, Department of Recreation and Parks (Jesse Owens Park)	I	50	Dominguez Channel
Los Angeles County Flood Control	I	5	Dominguez Channel
Martin Marietta Aluminum, Inc.	F	475	Dominguez Channel
Mobil Oil	NA	200	Dominguez Channel
Northrop Corp.	E	49.4	Dominguez Channel
Reynolds Metal[c]	B	NA	Dominguez Channel
Rockwell International Corp.[c]	E	NA	Dominguez Channel
Shell Oil Co. (Wilmington Refinery)	E	1,600	Dominguez Channel
Stauffer Chemical Co.	G	2,300	Dominguez Channel
Texaco, Inc.	I	108	Dominguez Channel

Table 3.2.15-6 (Contd)

Discharger	Type[a]	Waste Maximum Quantity (gal/day x 10^3)[b]	Receiving Water
Texaco, Inc.	B	5,760	Dominguez Channel
TRW, Inc.	E	15	Dominguez Channel
Union Carbide Co.	I	68	Dominguez Channel

[a]Waste discharge categories:
A = domestic sewage and industrial/commercial wastes
B = contact cooling wastes
C = industrial wastes
D = washwater wastes - industrial
E = noncontact cooling wastes
F = stormwater runoff
G = commercial wastes (other than industrial)
H = washwater wastes - commercial
I = other (including boiler blowdown, cooling tower bleedoff, and washwater)

[b]Maximum waste quantity refers to the maximum quantity of wastewater permitted by the RWQCB. These quantities must not be confused with average flow rates, which are not available.

[c]Existence unknown.

NA = not available.

Source: Schinazi, 1985.

B. Water Quality

The physiochemical or abiotic characteristics of the harbor largely determine the diversity and abundance of the flora and fauna. The Los Angeles Harbor Department routinely measures transparency, surface and bottom BOD, DO, and temperature. In addition, several studies (HEP, 1976; EQA-MBC, 1975, 1977) have addressed salinity, pH, and nutrients. These parameters are primarily affected by climate, circulation, biological activity, surface runoff, and effluent discharges. These interactions result in distinct spatial and seasonal variations in water quality.

For comparative purposes, the Los Angeles Harbor has been divided into outer harbor, inner harbor, and Main Channel regions. The area of the proposed landfill island and dredging is in the outer harbor area. Figure 3.2.15-6 and Table 3.2.15-7 show station locations and a breakdown of stations by region for selected water quality parameters shown in Table 3.2.15-8.

1. Transparency. The sun is the primary source of energy for the photosynthetic activities of phytoplankton, which is a major source of primary production in the harbor. Increases in suspended solids from storm runoff, effluent, dredging activities, or natural algal blooms can cause a reduction in transparency. The transparency of the harbor water ranged from 0.0 ft to 40 ft during 1980 to 1984. The range of means was 7.7 ft to 10.7 ft (Table 3.2.15-8). The inner and outer harbor stations had the highest means for the harbor compared to the Main Channel during winter, summer, and fall. Mean values in all regions and periods appear adequate to safeguard the beneficial uses of the harbor as a marine and fish habitat defined by the RWQCB (Schinazi, 1985).

2. Dissolved Oxygen. Changes in the metabolic activities of the harbor's marine biota are among the factors that influence the dissolved oxygen concentration in the water. The DO levels may fall to below healthy growth promoting levels when sewage and other effluents enter the harbor. A DO level standard of not less than 5 ppm at any time with an annual mean of 6 ppm has been established for the Los Angeles outer harbor in relation to point source discharges (Schinazi, 1985; SWRCB, 1979).

The DO levels in the harbor have been indicative of good water quality over the past 5 years. Surface and bottom DO in the Main Channel and outer harbor has averaged 6.2 ppm in 1980-1984 for all seasons (Table 3.2.15-8). Inner harbor surface DO exceeded 6 ppm in all seasons. Bottom DO in the inner harbor averaged 5.9 ppm in fall and winter. Minimum of DO as low as 0.0 ppm to 0.6 ppm have been recorded in the Main Channel (spring), outer harbor (summer), and inner harbor (spring and summer). These are probably indicative of short-term algal bloom conditions (Schinazi, 1985). The DO levels of 6 ppm or greater are characteristic of inner harbor stations. This indicates that adequate flushing exists to maintain good water quality.

Table 3.2.15-7 - Water Quality Stations and Corresponding Harbor Zones

Main Channel	Inner Harbor	Outer Harbor
23, 26, 30	11A, 14, 32, 33, 35, 39, 41, 44, 46, 47, 49, 49A, 55, 23	1, 3, 3A, 18A, 19A, 5, 6, 58, 59, 60, 61

Source: POLA, 1985a.

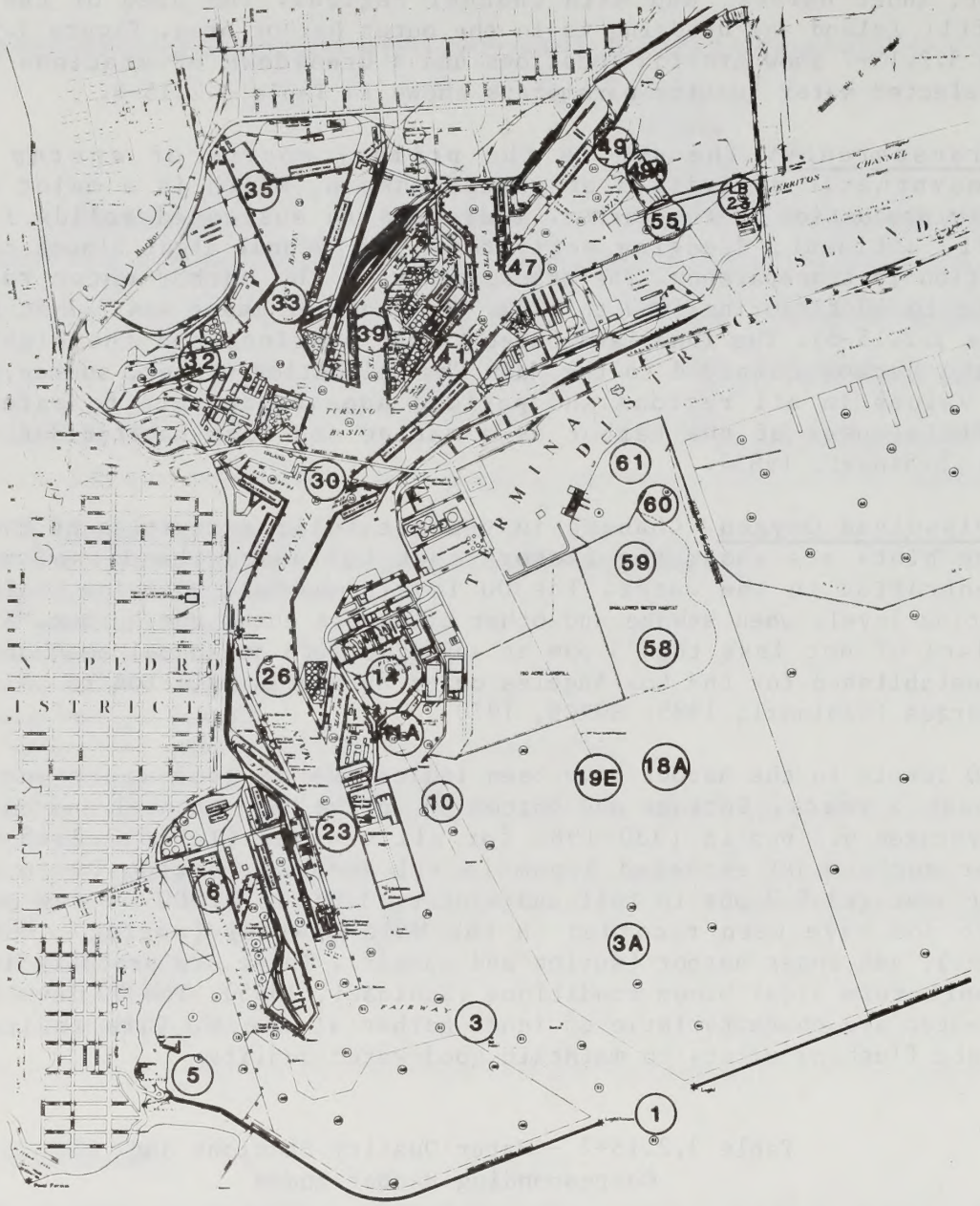


Figure 3.2.15-6 - Location of POLA Water Quality Sampling Stations (POLA, 1985a)

Table 3.2.15-8 - Summary of Water Quality Data by Quarter
(December 1979 through November 1984)

Ship	dwt (10^3)	Offloading Rate of Cargo (bbl/hr)	Scrubber Discharge (gal/min)	Sulfur Content of Fuel (%)	pH	Depth (ft)	pH Stations[a] A	B	C	D	E	F	G	H	I	J	K	N	Controls L	M
Arco Independence	152	15,000	1,250	0.2-0.5	-	0	7.8	8.0	7.9	7.7	7.7	7.8	-	8.0	-	8.0	8.0	-	8.0	8.0
						10	8.0	8.0	7.9	7.9	8.0	8.0	-	8.0	-	8.0	8.0	-	-	-
						20	8.0	-	-	-	8.0	8.0	-	-	-	-	-	-	-	-
Susanne Onstad	176	15,000	445	3.0-4.0	2.8	0	7.8	7.6	7.7	7.7	7.7	7.7	7.6	7.7	7.5	7.7	-	-	7.7	7.7
						10	7.7	7.6	7.8	7.7	7.7	7.7	-	-	7.6	-	-	-	-	-
						40	7.8	7.7	7.8	7.7	7.7	7.8	-	-	7.7	-	-	-	-	-
Amoco Trinidad	149	20,000	1,042	1.5-3.0	-	0	7.8	7.8	7.8	7.8	7.8	7.9	7.8	7.7	-	7.9	-	-	7.8	-
						10	7.8	7.9	7.8	7.8	7.8	7.9	7.8	7.8	-	-	-	-	-	-
						20	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-
Aegean Sun	122	30,000	990	2.0	3.6	0	7.8	-	-	-	7.8	7.8	-	-	-	7.8	-	-	-	7.8
						10	7.8	-	-	-	-	-	-	-	-	-	-	-	-	-
Susanne Onstad	-	24,000	445	3.0-4.0	3-1	0	7.7	7.9	8.0	7.9	8.0	7.9	8.0	8.0	7.9	8.0	-	8.0	8.0	8.0
						10	7.8	7.9	8.0	8.0	8.0	8.0	7.9	8.0	8.0	8.0	-	-	-	-
						20	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-

- = no sample.

[a]Station A was directly above the discharge while Stations B, C, D, E, F, were on a semicircle with a radius of 15 ft whose center was Station A. Stations B and F were astern of Station A. Stations G, H, and J were 50 ft from Station A. Station I was 30 ft astern of Station A. Stations K and N were 100 ft from Station A. Control Stations L and M were 1,000 ft forward and astern, respectively. Stations J and K were always located downcurrent of Station A.

Assumptions made during study:

(1) The inert gas system in operation at all times when pH measurements taken.
(2) Scrubber working at maximum efficiency during operation.
(3) No correlation between effluent pH and % efficiency of scrubber portion of IGS.
(4) Control Stations L and M were representative of ambient conditions.
(5) The inert gas system scrubber only factor influencing pH of discharge water.
(6) Samples of effluent obtained inside ship were representative of the discharge as it exited the ship.
(7) The discharge opening was a round hole in hull; discharge exhibited normal flow characteristics as it passed through the opening.
(8) Surface manifestation of discharge indicative of primary direction of flow.

Source: Rickleff and Sandell, 1977.

3. Temperature. A marked seasonal and spatial variation of water temperature in the harbor reflects influence of the adjacent ocean, climate, physical configuration of the harbor, and uses (effluent and intakes). Table 3.2.15-8 also shows a trend for all harbor zones of coolest water at surface and bottom in winter, with steady increases in spring to summer, and then slight decreases in fall. Based on 1980-1984 data, extremes in temperature for the main channel were a minimum 10.9°C and 10.8°C (winter) and maximum 24.0°C and 21.8°C (fall), surface and bottom respectively. Extremes in temperature for the outer harbor were minimum 13.0°C and 13.2°C (winter and spring) and maximum 24.2°C and 21.2°C (fall), surface and bottom respectively. Extremes in temperature for the inner harbor were minimum 13.2°C (winter) and maximum 24.0°C and 22.4°C (fall), surface and bottom respectively. Differences between surface and bottom temperatures were least in winter and greatest in summer. Average temperatures for the whole harbor were 17.5°C (surface) and 17.1°C (bottom) for 1980-1984.

4. pH. Seasonal averages of pH values for Los Angeles-Long Beach Harbors were determined by Harbors Environmental Projects for 1978 (HEP, 1980). The seasonal averages of pH ranged from 7.3 to 8.7. For most of the year, outer Los Angeles and outer Long Beach Harbors showed higher pH values than inner Los Angeles and inner Long Beach Harbors. Because the Los Angeles-Long Beach Harbors pH data is old (the most recent survey was conducted in 1978), conclusions based on this data are tenuous.

Values of pH showed a tendency at times to follow patterns of variation in DO; in some periods, the pattern was unrelated (HEP, 1976). The higher pH values (up to 8.7) were found usually in the warm months and at the surface. Lower values (down to 7.3) were generally found in cool months or near the bottom. Higher surface values may be related to increased amounts of photosynthesis and carbon dioxide decreases (Davis, 1977). Lower bottom values may be related to decreased photosynthesis and reducing conditions (i.e., production of hydrogen sulfide) (Davis, 1977).

5. Salinity. Variations in salinity occur in Los Angeles-Long Beach Harbors because of the effects of storm runoff, waste discharge, rainfall, and evaporation. Although salinities ranging from less than 10.0 ppt to greater than 39.0 ppt have been reported, harbor salinity usually ranges between 30.0 to 34.2 ppt (COE, 1984d, p. A-1-73).

6. Nutrients. In addition to light, the photosynthetic production of organic matter by phytoplankton may also be limited by the availability of inorganic nutrients such as soluble phosphates and nitrates. The spatial and temporal variations in these nutrients may be caused by biological processes, municipal or industrial wastewater disposal, and agricultural or stormwater runoff.

During 1978, Harbors Environmental Projects (1980) reported the following ranges of concentrations for nutrients in Los Angeles-Long Beach Harbors: phosphate 0.172-12.39 ppm; ammonia 0.12-119.28 ppm; nitrate 0.00-82.97 ppm; and nitrite 0.00-5.38 ppm. They found high levels of these nutrients throughout the harbor during January to March due to the unusually heavy rainfall and resulting stormwater runoff carrying nutrients to the harbor.

April to October were characterized as having relatively low and generally stable nutrient levels, except for some localized elevations in the Los Angeles outer harbor because of the influence of the Terminal Island Treatment Plant discharge and in the Long Beach outer harbor because of nutrient influxes via the Los Angeles River.

In the Long Beach Harbor, EQA-MBC (1978) found a vertical stratification of nutrients increasing with depth primarily in spring and summer. This stratification was caused by nutrient uptake by phytoplankton in the surface water and the development of a strong thermocline, which restricted replenishment of nutrients from the bottom waters. An absence of the thermocline in winter allows nutrient mixing throughout the water column.

Nutrient concentrations change from day to day and are heavily influenced by the surrounding environment. The enclosed nature of the harbor has created seasonal and spatial levels of nutrients that vary from the so-called normal levels in areas outside the breakwater. Table 3.2.15-9 shows the 1974 data for areas that correspond to the site of the proposed landfill island and dredging and pipeline crossing.

In the area of the proposed landfill island and dredging, phosphate was rather stable year-round, nitrate tended to peak twice between December and May, nitrite tended to be average to below average, and high ammonia concentrations may have been influenced by a sewer outfall that was adjacent to Terminal Island. In the area of the proposed pipeline crossing, nutrient values tended to be lower than in the outer harbor, the proposed landfill island, and dredging locations (Table 3.2.15-9) (HEP, 1976). Decrease in phosphate and nitrate are expected during times of high phytoplankton growth rates. High levels of ammonia usually follow these periods (Sverdrup et al., 1942).

Table 3.2.15-9 - Mean 1974 Concentration Ranges of Nutrients in the Area of the Proposed Landfill Island, Dredging, and Pipeline Crossing Compared to a Station Representative of the Southern California Bight

Nutrient	Range of Mean Concentration		
	Representative Station	Island and Dredging Area	Pipeline Crossing
PO_4 (ug-at P/liter)	0.25 - 1.10	0.46 - 1.13	0.90 - 1.12
NO_3 (ug-at N/liter)	0.00 - 21.28	7.24 - 13.86	8.70 - 8.84
NO_2 (ug-at N/liter)	0.00 - 0.46	0.12 - 0.81	0.20 - 0.23
NH_3 (ug-at N/liter)	0.00 - 2.60	1.60 - 5.84	3.10 - 4.81

Source: Modified from HEP, 1976.

Nutrient levels in the harbor are probably not limiting to phytoplankton except during bloom periods, based on comparison with levels in other areas (Sverdrup et al., 1942).

C. Marine Surficial Sediment Characteristics

The marine sedimentary regime of the harbor has been significantly modified by dredge and fill activities and the construction of the offshore and landside breakwaters and marine structures. Prior to the Los Angeles Harbor Deepening Project, the sediment regime of the harbor had been well characterized (HEP, 1976). Figure 3.2.15-7 shows the harbor areas where the sediment regime was significantly altered by the Harbor Deepening project. These areas have not been restudied to fully characterize the present regime (Soule, 1985). A discussion of the present regime is carried out here with the assumption that the outer harbor areas in the location of the landfill island can be characterized by the areas studied in 1976 (HEP, 1976).

Natural deposition in the harbor has been altered by dredge and fill activities. Dredge areas provide sediment traps that intercept the flow of bed-load sediments. Filled areas obstruct sediment movement and can cause deposition or erosion in adjacent areas. Filled areas also serve as new sources of sediment.

1. Physical Nature of Harbor Sediments. There is a wide variation in physical sediment conditions from the Long Beach Harbor to the Los Angeles Harbor. Long Beach Harbor is characterized by fairly uniform sediments. The Long Beach Harbor floor consists of a veneer of loose-to-firm surface sediments overlying dense older (Pleistocene) sediments. The veneer consists primarily of silt with isolated lenses of sand. The older strata is mostly sand with some lenses of silt, clay, or shales to at least a depth of -150 ft MLLW. The middle and inner harbor near-surface materials are similar to the outer harbor except the top 6 ft contain more organic constituents.

Unconsolidated sediments, which comprise the bulk of those found in Los Angeles Harbor, cover the harbor floor where bedrock is not exposed. These sediments consist of sands, silts, and clays, all in varying proportions; the predominating material is silty sand. The surface sediment is generally a soupy and very soft muck, consisting of clay and silt with minor amounts of sand (COE, 1984d, p. A-1-30). Prior to the Harbor Deepening Project, the sediments in the West Basin of Los Angeles Harbor were unconsolidated silty sand and clean clay with isolated portions of clean sand (COE, 1984d, p. A-1-30). The East Basin contained mostly silts and clays with a small amount of silty sand that extended south to the Vincent Thomas Bridge. These sediment regimes may still exist. Discussions presented here on sediment characteristics are based on HEP (1976).

The sorting values for the Los Angeles Harbor are generally slightly lower than shelf sediments in the southern California area. Most harbor areas have sorting values between 15% and 25%. Values in the area of the proposed landfill island and pipeline appear to be 20% to 25%. Areas of higher sorting (25%) appear only in channel areas and possibly at the entrance to the Seaplane Anchorage.

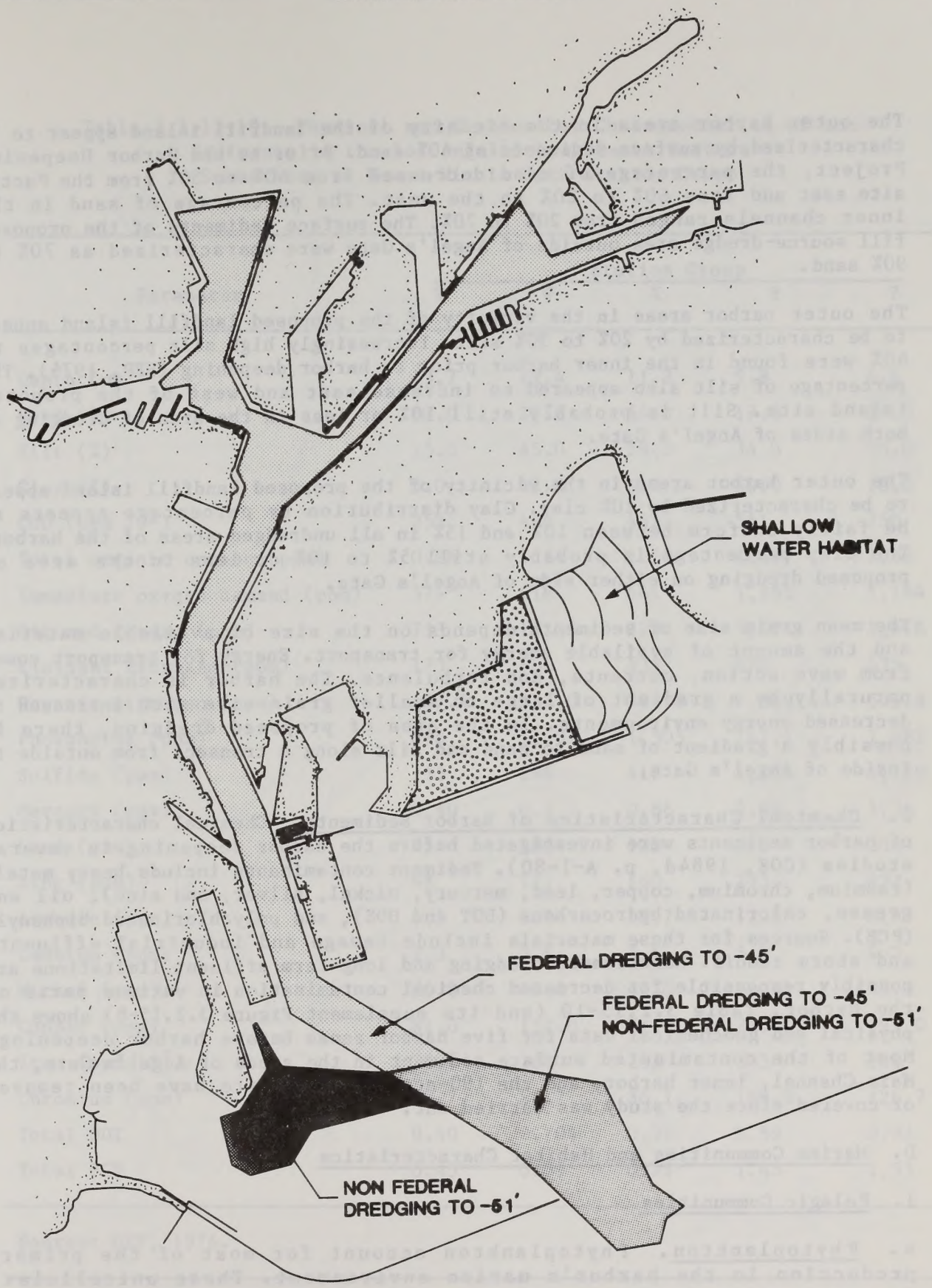


Figure 3.2.15-7 - Harbor Deepening Project Dredge and Fill Areas
(COE-L.A. Harbor Department, 1980, p. 162)

The outer harbor areas in the vicinity of the landfill island appear to be characterized by surface sediments of 60% sand. Prior to the Harbor Deepening Project, the percentage of sand decreased from 60% to 30% from the Pactex site east and from 60% to 20% to the west. The percentage of sand in the inner channels ranged from 20% to 70%. The surface sediments of the proposed fill source-dredge area outside of Angel's Gate were characterized as 70% to 90% sand.

The outer harbor areas in the vicinity of the proposed landfill island appear to be characterized by 20% to 30% silt. Increasingly high silt percentages to 60% were found in the inner harbor prior to harbor deepening (HEP, 1976). The percentage of silt also appeared to increase east and west of the proposed island site. Silt is probably still 10% or less in the area of dredging on both sides of Angel's Gate.

The outer harbor areas in the vicinity of the proposed landfill island appear to be characterized by 10% clay. Clay distribution by percentage appears to be fairly uniform between 10% and 15% in all undredged areas of the harbor. The clay percentage is probably still 5% to 10% or less in the area of proposed dredging on either side of Angel's Gate.

The mean grain size of sediments depends on the size of available material and the amount of available energy for transport. Energy for transport comes from wave action, currents, and turbulence. The harbor is characterized naturally by a gradient of large to smaller grain size with increased to decreased energy environments. In the area of proposed dredging, there is possibly a gradient of sand to sand and silt along a transect from outside to inside of Angel's Gate.

2. Chemical Characteristics of Harbor Sediments. Chemical characteristics of harbor sediments were investigated before the harbor deepening in several studies (COE, 1984d, p. A-1-80). Sediment contaminants include heavy metals (cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc), oil and grease, chlorinated hydrocarbons (DDT and DDE), and polychlorinated biphenyls (PCB). Sources for these materials include sewage and industrial effluents and storm runoff. Maintenance dredging and long-term effluent limitations are possibly responsible for decreased chemical contamination in various parts of the harbor. Table 3.2.15-10 (and its supplement Figure 3.2.15-8) shows the physical and geochemical data for five harbor zones before harbor deepening. Most of the contaminated surface sediment in the areas of Angel's Gate, the Main Channel, inner harbor, and the 190-acre landfill site have been removed or covered since the study was carried out.

D. Marine Communities and Habitat Characteristics

1. Pelagic Communities.

a. Phytoplankton. Phytoplankton account for most of the primary production in the harbor's marine environment. These unicellular, free-floating marine plants (10 microns to 1 mm in size) inhabit the upper layers of the water column. The size and species composition of phytoplankton

Table 3.2.15-10 - Physical and Geochemical Characteristics of the Sediments in the Los Angeles-Long Beach Harbors Summarized as Means Within Each Station Group

Parameter	Station Group				
	V	W	X	Y	Z
Depth (m)	13.7	12.4	11.8	9.8	6.6
Sand (%)	80.0	22.6	64.0	17.0	27.0
Silt (%)	15.0	45.0	28.0	34.0	55.0
Clay (%)	5.0	42.0	8.0	50.0	18.0
COD (ppm 10^2)	259	466	462	561	750
Total organic carbon (ppm)	0.86	1.34	1.20	1.49	1.83
Immediate oxygen demand (ppm)	374	618	664	1,252	1,194
Oil and grease (ppm)	733	1,235	229	3,494	2,616
Kjeldahl nitrogen (ppm)	173	666	438	678	635
Organic nitrogen (ppm)	167.4	323.0	398.8	1,889.4	595.8
Phosphorus (ppm)	896	1,432	1,305	147.1	1,482
Sulfide (ppm)	135	296	417	1,284	1,128
Mercury (ppm)	0.40	0.5	0.86	2.05	1.36
Lead (ppm)	75	100	102	141	206
Zinc (ppm)	96	171	160	293	432
Arsenic (ppm)	6.5	6.9	10.7	12.8	8.8
Cadmium (ppm)	2.3	3.6	3.5	5.0	4.2
Nickel (ppm)	30.0	48.0	42.0	58.0	45.0
Copper (ppm)	81.0	151.0	81.0	213.0	199.0
Iron (ppm 10^2)	209	364	265	305	284
Chromium (ppm)	38.7	83.7	86.1	188.8	126.7
Total DDT	0.40	0.704	0.38	0.59	0.97
Total PCB	0.45	0.59	0.71	1.45	1.53

Source: HEP, 1976.

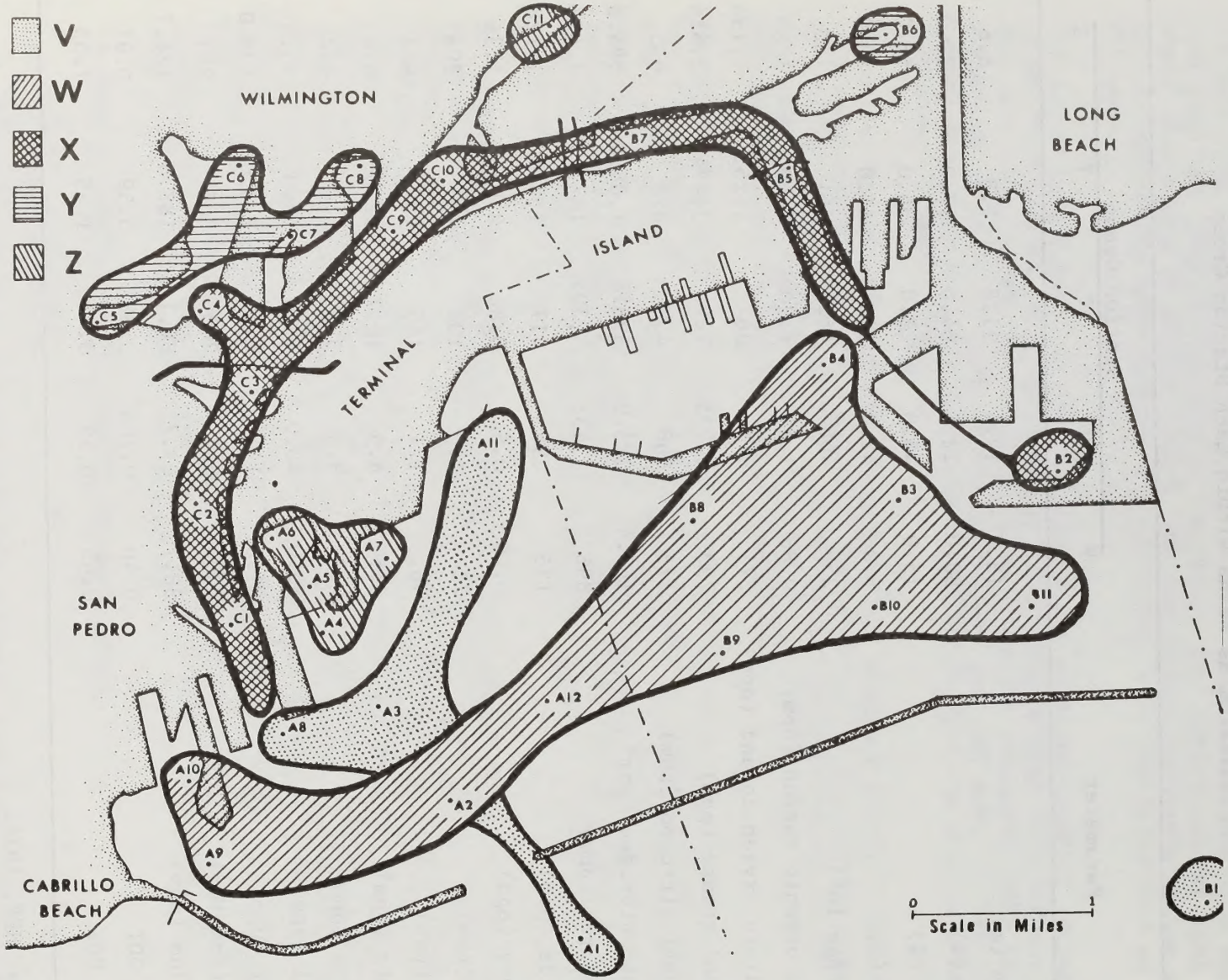


Figure 3.2.15-8 - Physical and Geochemical Characteristics of the Sediments in the Los Angeles-Long Beach Harbors Summarized as Means Within Each Station Group (HEP, 1976)

populations and their photosynthetic activities are affected by such factors as nutrient availability, temperature, light, salinity, and residence time.

The operational control of the phytoplankton population and its processes is regulated by more than one factor that may be different at different times (HEP, 1976):

(1) Chemical factors such as dissolved oxygen, phosphorous and nitrogen concentrations, temperature, salinity, and pH.

(2) Physical factors such as light transmittance, and vertical and horizontal transport from wind, waves, currents, and tides.

(3) Biological factor of grazing consumption by zooplankton and small animals, especially larval stages of benthic invertebrates.

Three major types of information are used to characterize phytoplankton populations:

(1) Chlorophyll a values are used to measure standing crop or abundance.

(2) Primary productivity values (grams of carbon produced per unit area or per time) reflect ability of phytoplankton to produce organic material under given marine environmental conditions. The measurement of primary productivity reflects the ability of the waters to support the initial production of food upon which the rest of the trophic structure feeds.

(3) Assimilation ratio is the capacity of a unit of the standing crop to assimilate nonliving nutrients and convert them to living material. The ratio is used to indicate limits to growth, inhibiting conditions, or populations in rapid growth phases.

Extensive studies of phytoplankton productivity, chlorophyll a, and assimilation ratios have been carried out in Los Angeles-Long Beach Harbors since 1971. These studies usually included monthly samples at a series of stations within the harbor. Surveys of San Pedro Bay were done in 1973-1974 (HEP, 1976; Oguri, 1976) and in 1978 (HEP, 1980). Two surveys of outer Los Angeles Harbor have been made, the first in 1971-1973 (Oguri, 1974) and the second in 1976-1978 (HEP, 1979). Long Beach Harbor was studied and summarized in various marine monitoring reports for the Long Beach Generating Station. Additional limited studies of phytoplankton have been made for various impact reports for Inner Los Angeles Harbor (COE, 1984d, pp. A-1-94 to -98).

An accurate description of phytoplankton abundance or occurrence in the Harbors is difficult because of the yearly variations that are evident in the study results. Diatoms and dinoflagellates comprise most of the total phytoplankton; diatoms dominated the harbors area except for the major dinoflagellate blooms in June, August, and September 1974, and less so in November 1975 (HEP, 1980). The genus Chaetoceros dominated the phytoplankton, including 25 identified to species plus unidentified

Chaetoceros spp. Other numerically important species were Asterionella japonica, Skeletonema costatum, Eucampia zoodiacus, Leptocylindrus danicus, Nitzschia spp., and Thalassiothrix sp. Table 3.2.15-11 shows 10 genera of diatoms and 8 genera of dinoflagellates typically found in the Harbors.

Table 3.2.15-11 - Diatoms and Dinoflagellates Common to Los Angeles-Long Beach Harbors

Diatoms	Dinoflagellates
Asterionella japonica	Ceratium spp.
Chaetoceros spp.	Dinophysis caudata
Coscinodiscus spp.	Exuviella spp.
Eucampia sp.	Gonyaulax polyhedra
Leptocylindrus sp.	Gymnodinium spp.
Nitzschia sp.	Noctiluca sp.
Phizosolenia spp.	Peridinium sp.
Skeletonema sp.	Prorocentrum gracilis
Thalassiosira rotula	Prorocentrum sp.
Thalassiothrix sp.	

Source: HEP, 1976.

Certain phytoplankton species proliferate seasonally or under particular environmental conditions. Red tide blooms that occur in late spring or early summer are localized and dominated by the dinoflagellate Prorocentrum micans (HEP, 1976). Red tides occurring in late summer and early fall are dominated by Gonyaulax polyhedra, an armored dinoflagellate associated with fish kills (HEP, 1976). In any particular year or season, the dominant dinoflagellates can vary.

In spring, there is a general bloom, primarily of diatoms that give a greenish cast to harbor and coastal waters (HEP, 1976). Density of the spring bloom can vary in the entire harbor. It is considered a normal cyclic occurrence. Localized, intense green-water blooms dominated by a euglenoid flagellate, Eutreptia sp., have been observed (HEP, 1976).

Values for phytoplankton productivity and chlorophyll a within the harbor were generally higher than those in adjacent open coastal waters because of the presence of high nutrient levels in the harbor caused by waste effluents and runoff (HEP, 1976). These differences were most pronounced during bloom periods in the spring, summer, and fall. The inner harbor showed higher average values for primary productivity and chlorophyll a than did the outer harbor stations. Inner Long Beach Harbor had generally higher primary productivity values and chlorophyll a concentrations, as well as more

uniform distributions than stations that occurred in inner Los Angeles Harbor. Areas with the highest phytoplankton values were near waste outfalls and at the mouth of the Los Angeles River. Inner harbor stations that demonstrated high productivity and chlorophyll a were considered to be influenced also by poor circulation.

A general pattern of seasonal changes in productivity and chlorophyll a in the harbors is obscured by the occurrence of blooms of phytoplankton. The intense blooms of late summer to early fall can also occur during other parts of the year. The late fall and early winter in October, November, and December generally show a sharp drop from the productivity and chlorophyll a values of late summer/early fall (HEP, 1976). The lowest values of the year typically occur in January and February. Moderate diatom blooms at most sites in the harbor in March through May sometime precede intense late summer/early fall blooms. A secondary bloom of dinoflagellates usually occurs in late spring/early summer.

Figure 3.2.15-9 shows stations where productivity was measured in the harbor (HEP, 1976). Inner harbor stations such as C8, C9, C10, and C11 showed low chlorophyll a and low-to-moderate productivity and assimilation ratios. Stations A1 and B1 showed low productivity and minimal occurrence of red tide blooms. These stations are influenced mainly by water from outside the harbor. Stations A2 and A3 in the vicinity of the landfill island are influenced by water from inside and outside the harbor. Values for these stations appear quite separate from inner harbor stations and Stations A1 and B1 beyond the breakwater (HEP, 1976). The D stations in the eastern part of San Pedro Bay were characterized as the most productive with the highest chlorophyll a concentrations (HEP, 1976).

The interrelationships for determining the role of phytoplankton in harbor ecology have been suggested (HEP, 1976; 1979). Correlations between chlorophyll a and productivity suggest that a change in productivity is associated with the photosynthetic population. The regulation of production could thus be due to limiting the factors among the physiological needs of the phytoplankton. The related stations include all the main and inner channel locations in Los Angeles Harbor, the inner harbor locations A10, A9, A8, A3, and A2, and the A1 location outside the breakwater (Figure 3.2.15-9).

A correlation between productivity and assimilation ratio suggests that a population of photosynthetic organisms is either stimulated or has had some inhibition removed, permitting increased productivity per unit of population. These stations include several in the Los Angeles Harbor, main channel and inner harbor sites, and inner harbor sites where red tide blooms (dinoflagellates) frequently occur.

b. Zooplankton. Among the planktonic animals of the harbor, the zooplankton can include a large number of small crustaceans such as copepods, ostracods, amphipods; jellyfish and siphonophores; many types of polychaete worms; hydroids; and the eggs and/or larval stages of numerous benthic and nektonic animals (HEP, 1976; Sverdrup et al., 1942). The zooplankton in the harbor can be broken down to categories defined according to the life cycle duration in the pelagic state, to size, or to habitat. Temporary

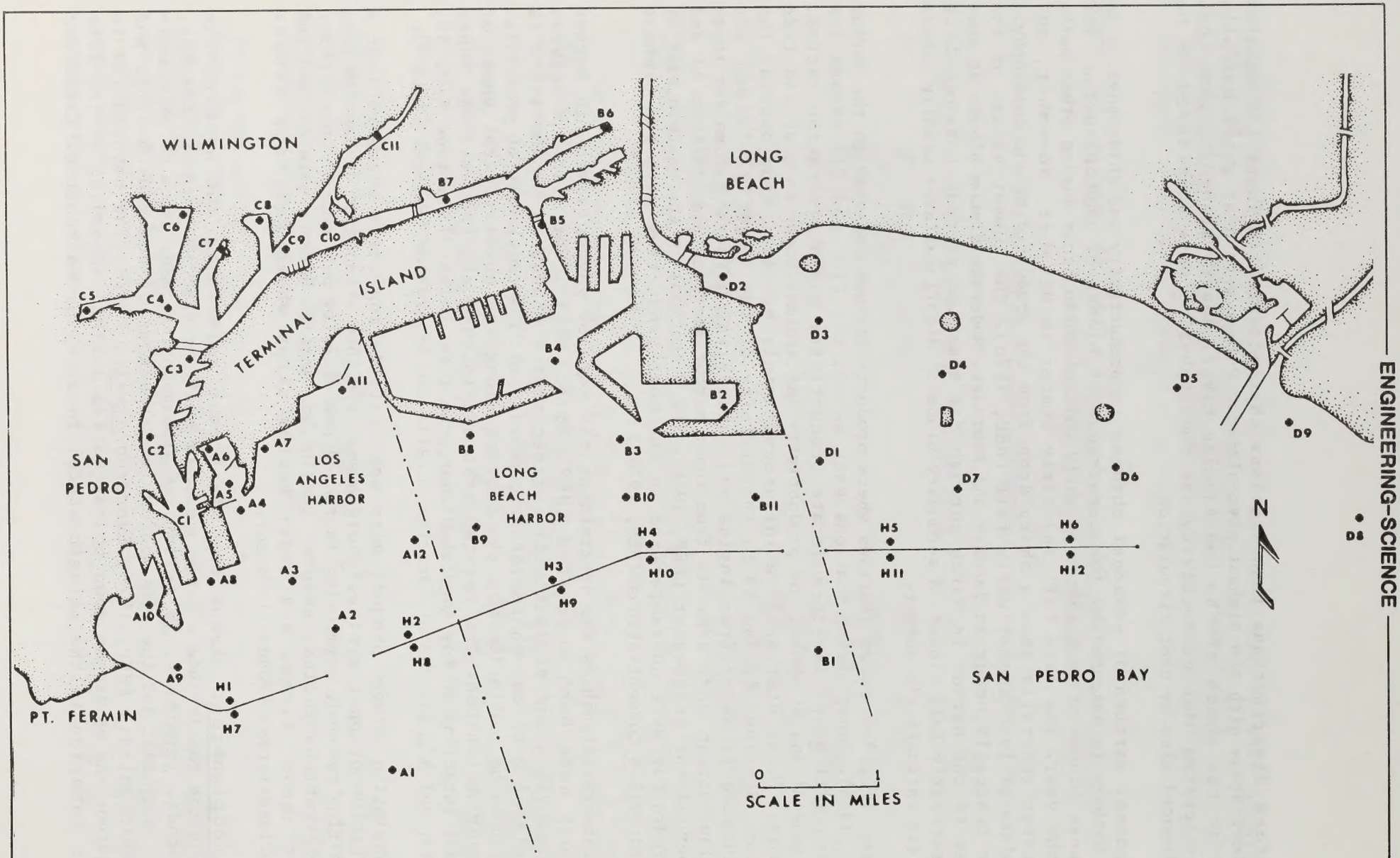


Figure 3.2.15-9 - Los Angeles-Long Beach Harbors: Stations for Productivity Measurement (HEP, 1976)

components of plankton, or meroplankton, are composed mainly of developmental stages of the invertebrates. The permanent components of plankton, or holoplankton, are composed of forms representing nearly every phylum of the animal kingdom with the exception of the sponges, bryozoans, and phoronids. Sverdrup et al. (1942) list several categories of animals that fall between the two categories. Generally, the zooplankton are microscopic or semimicroscopic in size and have specific swimming or floating adaptations for a planktonic existence.

Plankton samples were collected from the harbor during 1973 and 1974 (HEP, 1976), and 1978 (HEP, 1979). The zooplankton of the middle and inner Long Beach Harbor have been sampled and additional limited studies have been made for various environmental impact reports in the inner Los Angeles Harbor (COE, 1984d, pp. A-1-94 to -100).

The zooplankton in the harbors is dominated by crustaceans, especially the calanoid copepod (Acartia tonsa) whose mean numbers amount to 58% of all planktonic animals (Table I.2-1; HEP, 1976). Next in abundance are the cladoceran Podon polyphemoides (11%), the copepod Paracalanus parvus (10%), the cladoceran Evadne nordmanni (4.7%), and the copepod Corycaeus anglicus (1.6%) (HEP, 1976). A later study (HEP, 1979) showed Acartia as the most abundant plankter but summarized slightly different percentages and/or species within the other top four positions (COE, 1984d, p. A-1-99). Other abundant organisms are Larvacea and barnacle nauplii (larvae) at approximately 5% each. The remainder (5% of the total sample) is made up of small proportions of other organisms. These low-abundance organisms were found either in consistently low abundance or only occasionally in large numbers.

A distribution pattern of dominant zooplankton divides the harbor into inner and outer zones. The zooplankton of the inner harbor is dominated by high concentrations of Acartia tonsa and the cyclopoid copepod (Oithona oculata). With the inner harbor fauna characterized by 75% Acartia, three other major zooplankton - Podon, Evadne, and Penilia avirostris (cladoceran) - are greatly decreased in abundance. The inner harbor also shows a decrease in abundance of fish eggs, as well as larvae of fish and bryozoans. Cladocerans were as much as 1,000 times less abundant in the inner harbor than the outer harbor. The outer harbor is characterized by large populations of Acartia tonsa, Corycaeus anglicus, Evadne nordmanni, Podon polyphemoides, and Penilia avirostris.

Mean spacial distributions of various zooplankton groups in the area of the proposed landfill site are shown in Table 3.2.15-12. The total zooplankton in the proposed landfill area of 3,000 to 4,000/m^3 appears similar to other outer harbor areas. Figure I.2-2 shows that the outer harbor is fairly uniform in mean spatial distribution of zooplankton. Station A12 (Figure I.2-3) shows slightly higher mean concentration of fish eggs and larvae (>9/m^3) than the average of 5/m^3 in the outer harbor stations.

In terms of species diversity, the inner harbor has a lower diversity and a less stable zooplankton community; the outer harbor is more diverse and more stable. The open coast areas outside of the breakwater have the highest

Table 3.2.15-12 - Mean Spatial Distributions of Important Zooplankton and Total Zooplankton at a Station Near the Proposed Landfill Island

Zooplankton	Mean Concentration (per m^3)
Acartia tonsa (copepod)	600<, ≤1,200
Oithona oculata (copepod)	1<, ≤3
Podon polyphemoides (cladocera)	400<
Evadne nordmanni (cladocera)	200<, ≤300
Penilia avirostris (cladocera)	4<, ≤8
Fish eggs and larvae	9<
Paracalanus parvus (copepod)	500<
Barnacle nauplii (arthropod)	50<, ≤80
Larvacea	200<, ≤300
Corycaeus anglicus (copepod)	30<, ≤50
Total	3,000<, ≤4,000

Source: Modified from HEP, 1976.

diversity and greatest stability in the harbor area (HEP, 1976). Chemical and thermal effluents, salinity, dissolved oxygen, and pH are cited as factors controlling distribution and abundance (HEP, 1976).

Temporal abundance for important zooplankton species and all zooplankton is presented in Figure I.2-4. The copepods Acartia tonsa, Paracalanus parvus, and Corycaeus anglicus demonstrate patterns of high abundance in winter months and low abundance in summer months. Intermittent peaks of abundance may occur, particularly in the spring. The cladocerans Podon polyphemoides and Evadne nordmanni show evidence of similar low summer abundances but greater variation. Both species were present throughout the year, and Podon had a minor peak in fall and winter of one sampling year (HEP, 1976). Spring maxima for both species were observed although not consistently for all 3 years of study.

c. Fish and Ichthyoplankton. Investigation of fish and ichthyoplankton in Los Angeles-Long Beach Harbors began even before the completion of the breakwaters (COE, 1984d, p. A-1-117). Intensive study of the harbor's fish population, however, began in 1972, concurrent with the growing environmental movement and promulgation of environmental statutes that mandated the accumulation of a biological data base.

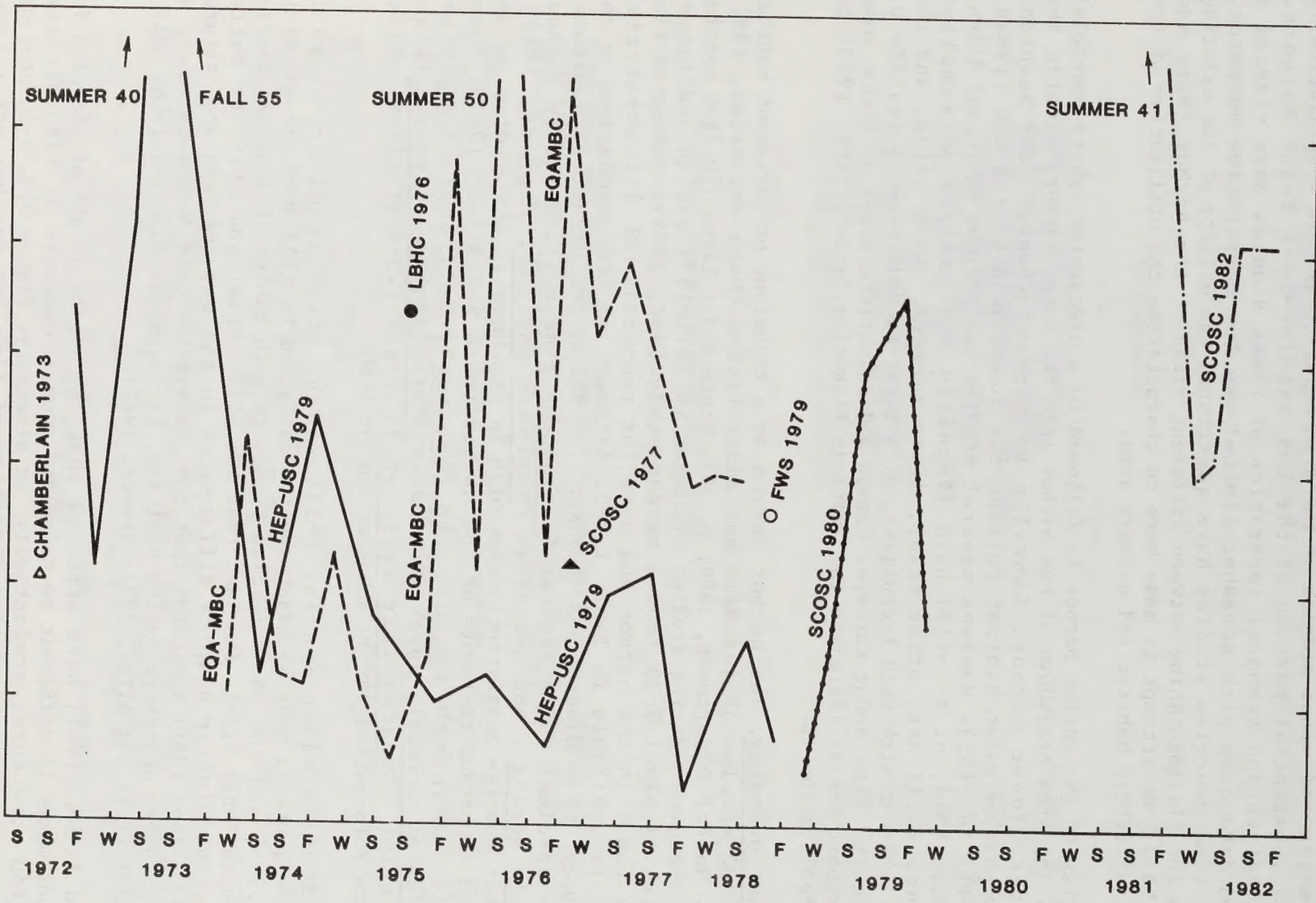
Various major and minor studies of the fish populations have synergistically covered a substantial portion of the Los Angeles-Long Beach Harbors. Regionalization and temporal separation of these studies have created a fragmented data base with somewhat limited use for comparative purposes. Although some overview studies have questioned the utility of the existing data base for distinguishing between different areas of the harbor (Horn and Allen, 1981), an attempt is made here to characterize the utilization of the harbor as a fishery habitat and nursery area.

An overview of the entire harbor is followed by a discussion (where possible) by zones. The area breakdown of the harbor into the outer harbor, outside the breakwater, inner harbor, Cabrillo Beach-West Channel, and Seaplane Anchorage-shallow water habitat follows the zones used by the COE (1984d, pp. A-1-117 to -153). Whereas several studies and reviews (Horn and Allen, 1981; COE, 1984d, p. A-1-117) have discussed the variety of sampling techniques (gill net, otter trawl, diver surveys, purse seine, and the problems inherent with each technique), no attempt is made here to qualify or calibrate the data among surveys. Common and scientific names of fishes used in this report are as listed by the American Fisheries Society (AFS, 1980) in Special Publication 12.

i. Harbor Overview. The harbor serves as a transient or permanent habitat for over 130 species of juvenile and adult fishes (Horn and Allen, 1981; COE-L.A. Harbor Department, 1980, p. 34). Table I.3-1 lists 120 fish species found in the harbor during studies conducted in 1971-1979 and an additional 17 species (Table I.3-2) from a recent study (MBC, 1984). A list of fish commonly found in the harbor and used for recreational and commercial purposes is available in Table I.3-3. Although the fish populations of the harbor appear to be diverse and abundant, 75%-85% of the harbor is dominated by three species: white croaker (Genyonemus lineatus), northern anchovy (Engraulis mordax), and queenfish (Seriphus politus) (Brewer, 1983). Four other species consistently rank high in abundance in all studies and are considered important residents of the harbor (Horn and Allen, 1981). These are white seaperch (Phanerodon furcatus), California tonguefish (Symphurus atricauda), speckled sanddab (Citharicthys stigmaeus), and shiner perch (Cymatogaster aggregata). Table I.3-4 provides habitat preference information for 30 abundant harbor fish.

The 16 most abundant species collected by otter trawl are shown in Table I.3-5, the 23 most abundant species collected by gill net are shown in Table I.3-6, and the nine species common to both tables of abundant species are given on Table I.3-5. The fact that the otter trawl and gill net tables are somewhat similar despite differences in the way the fish are captured (Horn and Allen, 1981) indicates that the Los Angeles-Long Beach Harbors, as with most other nearshore marine habitats, is dominated numerically by only a few species (Horn and Allen, 1981; Brewer, 1983).

Horn and Allen (1981) have stressed that the nature of all of the data for the harbor makes it difficult to calculate such parameters as fish density, population structure, productivity, or diversity. Figure 3.2.15-10 presents an attempt at showing average densities of fish for various otter trawl surveys taken at various locations in Los Angeles-Long Beach Harbors. From



Note: line format used only to distinguish between separate surveys.

Figure 3.2.15-10 - Interpolated Average Density of Fish Caught by Otter Trawl in Los Angeles-Long Beach Harbors (FWS, 1985)

1972 to 1982, there is a trend toward higher densities in the summer and fall ranging from 40 to 55 fish per 100 m^2, to low densities in winter ranging from 2 to 10 fish per 100 m^2. Juvenile and adult individuals of most species are more abundant during the spring and summer than in winter (Horn and Allen, 1981).

Studies on ichthyoplankton and fish spawning have elucidated trends in abundance, density, or occurrence that help to characterize the harbor in terms of spawning and nursery grounds (Brewer, 1983, 1984). There are no taxa of fish larvae captured exclusively inside the breakwater (Brewer, 1983), which indicates that, although the harbor is a fish nursery area, it probably does not serve as a unique spawning or nursery habitat (MBC, 1984). Brewer (1983) did not find higher abundance of food or game fish larvae inside the harbor than outside the breakwater. This would seem to indicate that although the harbor is a viable, productive habitat for commercially and recreationally valuable species, areas outside the breakwater may have an equally important nursery role. The nursery function of the harbor for nearshore coastal fish has been demonstrated by recent studies cited in Horn and Allen (1981). Juvenile fish were found to comprise 82% of the total individuals of the 20 most abundant species. The 20 species accounted for 98.5% of all fish captured (SCOSC, 1980).

Very little is actually known about the spawning and life history aspects of most commercially and recreationally important fish in the Los Angeles Harbor (Fougner, 1985; Horn and Allen, 1981; Mall, 1985). One species, the northern anchovy, is better understood than others (Horn and Allen, 1981; Brewer, 1975). The northern anchovy appears to be a key component in the harbor's ecology as a major consumer of zooplankton and a major forage food for fish of other trophic levels. The northern anchovy uses the area inside and outside the breakwater for spawning, nursery, and adult habitat.

Other possibly important trophic relationships in the harbor have been cited. Several carnivorous fish are probably important to the trophic relationships of demersal fish populations (Horn and Allen, 1981). These carnivorous species include barred sand bass (*Paralabrax nebulifer*), kelp bass (*P. clathratus*), California halibut (*Paralichthys californicus*), and several species of rockfish (*Sebastes* spp.). Trophic interactions of these and other harbor fish species are shown in Table I.3-7.

Horn and Allen (1981) noted the occurrence of several species of large, fast-swimming predators in the harbor whose overall importance to the harbor ecosystem is unknown. These include gray smoothhound (*Mustelus californicus*), leopard shark (*Triakis semifasciata*), white seabass (*Cynoscion nobilis*), California corbina (*Menticirrhus undulatus*), and bat ray (*Myliobatis californica*).

Ichthyoplankton in the harbor area tends to be dominated by various species on a spatial and temporal basis. Table I.3-8 shows that larvae of northern anchovy, white croaker, blenny (*Hypsoblennius* spp.), arrow goby (*Clevelandia ios*), and Gobiidae have all been found to be very abundant. Brewer (1983) has found striking similarity between the abundance of ichthyoplankton and juvenile-adults in the harbor area. A master list of fish larvae and eggs is presented in Table I.3-9 from four studies covering 1976-1982.

Egg and larval abundance tend to be highest in late winter and early spring immediately preceeding the annual juvenile recruitment of the majority of species (Horn and Allen, 1981; MBC, 1984). Densities of larval fish in the Long Beach Harbor, particularly spring season occurrences, could be associated with spring diatom blooms (MBC, 1984). Densities of larval fish are strongly influenced by seasonal changes in the populations of northern anchovy, cheekspot goby (Ilypnus gilberti), white croaker, and blenny (MBC, 1984). Dominant ichthyoplankton taxa collected in Long Beach Harbor over a 12-month period are shown by month in Table I.3-10.

The large number of ichthyoplankton and juvenile-adult species reported reflects the wide variety of nursery and adult habitats present in the harbors. Ichthyoplankton data from Brewer (1983), MBC (1984), and SCOSC (1980, 1982) also emphasizes the importance of inner and outer harbor riprap or breakwaters as adult fish habitats. One study found that of the 59 taxa of larvae collected, the adults of the taxa were broken down as 44% reef species, 29% benthic species, 20% pelagic species, and 7% epibenthic species (MBC, 1984).

ii. Adjacent Neritic. Several reports (Brewer, 1983; COE, 1984d, p. A-1-129; MBC, 1984) have documented close similarities of species abundance, richness, and occurrence for larvae, juveniles, and adults in neritic areas and the outer harbor. Table I.3-11 shows larval fish captured inside and outside the breakwaters. This table provides leverage for the assessment (Brewer, 1984) that there are few species, if any, that utilize the area inside the breakwater as exclusive spawning, nursery, or adult habitats. The five most abundant species in the neritic zone (Table I.3-12) appear to be similar to the most abundant species in the outer harbor (Table I.3-13). The difference in the abundance between the outer harbor and neritic areas is probably due to benthic substrate differences: soft bottom versus sand-rock ledges. Similarities in diversity and total number of species for outer harbor versus neritic stations, as well as lower density and standing crop for neritic stations, have been reported (MBC, 1984).

iii. Outer Harbor. Surveys of the outer harbor have established that 5 to 7 species of fish generally comprise more than 90% of the total catch. Table I.3-13 shows the most abundant species. White croaker is the most abundant, followed by California tongue fish, speckled sanddab, northern anchovy, and white seaperch. The mean fish density is 0.11 fish per m^2 (COE, 1984d, p. A-1-122).

Fish populations in the outer harbor may be unevenly distributed. Figure 3.2.15-11 shows that the western end, which includes the proposed Pactex site, was generally high in flatfish species and low in overall abundance. The middle area was high in rockfish abundance. The zone extending from the east to Fish Harbor in Long Beach had low species richness (catch per trawl), few flatfish, and high abundance of white croaker, queenfish, and other species.

Abundance and species richness may vary seasonally and yearly in the outer harbor. Maximum population levels achieved in late spring and early fall drop in late fall to yearly low levels in winter. Seasonal peaks appear to reflect juvenile-young of the year recruitment (Brewer, 1983).

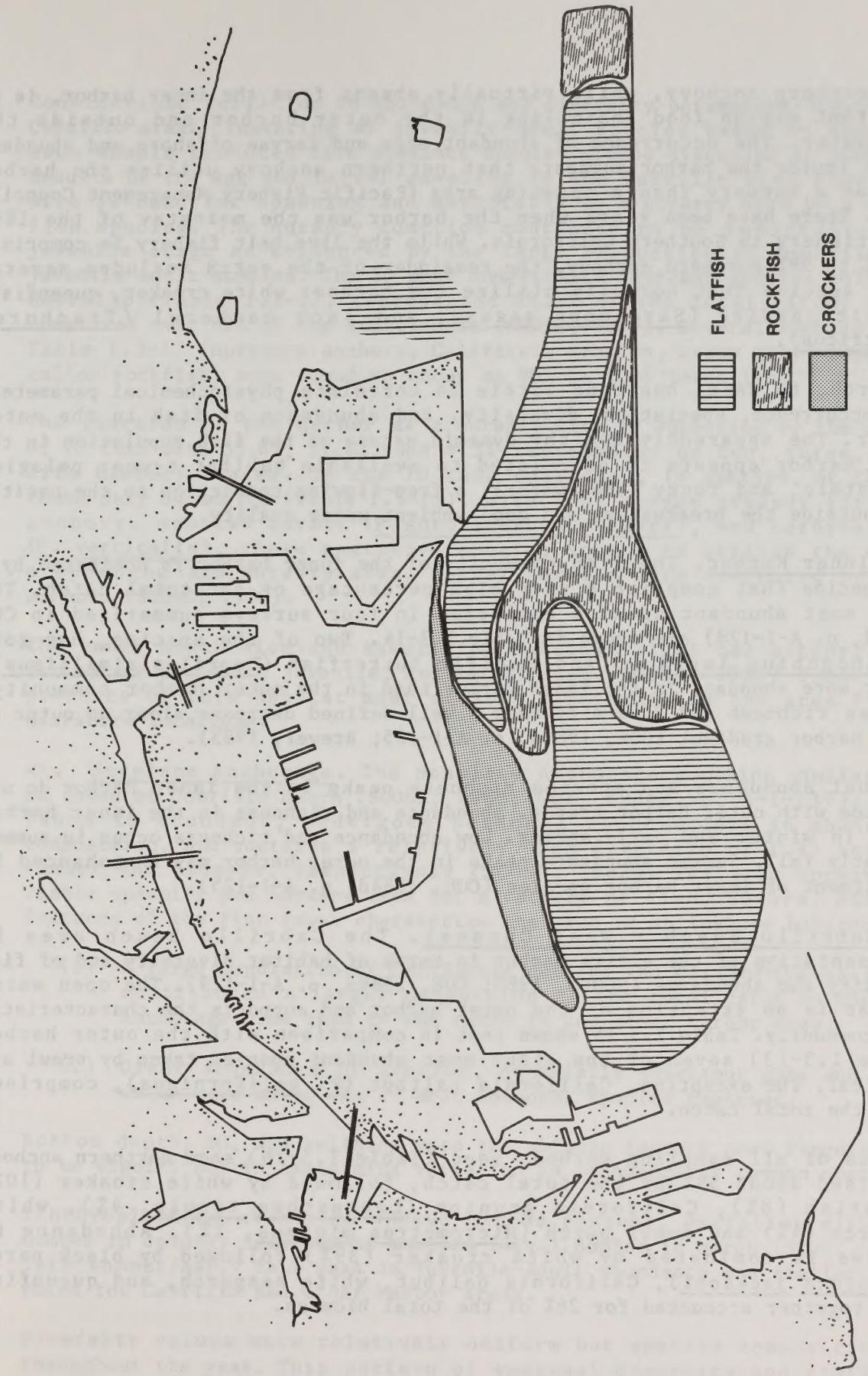


Figure 3.2.15-11 - Los Angeles Harbor: Distributional Pattern of Fishes
(Stephens et al., 1974)

The northern anchovy, while virtually absent from the inner harbor, is an important marine food chain link in the outer harbor and outside the breakwater. The occurrence of abundant eggs and larvae offshore and abundant larvae inside the harbor suggests that northern anchovy utilize the harbor more as a nursery than a spawning area (Pacific Fishery Management Council, 1983). There have been years when the harbor was the mainstay of the live bait fishery in Southern California. While the live bait fishery is comprised of 98% to 99% northern anchovy, the remainder of the catch includes several other species that normally utilize the harbor: white croaker, queenfish, Pacific sardine (Sardinops sagax), and jack mackerel (Trachurus symmetricus).

Research, to date, has done little to correlate physiochemical parameters with occurrence, speciation, diversity, and abundance of fish in the outer harbor. The apparently healthy dynamic nature of the fish population in the outer harbor appears to be related to available habitat types: pelagic, epibenthic, and rocky (breakwater), a free-flowing connection to the neritic area outside the breakwater, and good ambient water quality.

iv. Inner Harbor. The fish community of the inner harbor is dominated by a few species that comprise a very high percentage of the total catch. The eight most abundant species collected in four surveys summarized in COE (1984d, p. A-1-128) are shown in Table I.3-14. Two of the species, bay goby (Lepidogobius lepidus) and Pacific butterfish (Peprilus simillimus), appear more abundant in the inner harbor than in the outer harbor community. Species richness and diversity show a well defined decrease along on outer to inner harbor gradient (COE, 1984d, p. A-1-125; Brewer, 1983).

Seasonal abundance and species richness peaks in the inner harbor do not coincide with outer harbor trends. Abundance and richness in the inner harbor occur in winter and early spring. Low abundance and richness occur in summer and early fall. Summer abundance peaks in the outer harbor may be enhanced by recruitment of inner harbor species (COE, 1984d, p. A-1-125).

v. Cabrillo Beach - West Channel. The Cabrillo Beach area is representative of the entire harbor in terms of habitat diversity and of fish diversity and abundance (SCOSC, 1980; COE, 1984d, p. A-1-129). The open water habitat is an extension of the outer harbor and supports the characteristic fish community. Table I.3-15 shows that in comparison with the outer harbor (Table I.3-13) seven of the eight most abundant species taken by trawl are identical. The exception, California halibut (P. californicus), comprised 3% of the total catch.

Results of all sampling methods used (Table I.3-16) show northern anchovy comprised about 59% of the total catch, followed by white croaker (10%) queenfish (8%), California grunion (Leuresthes tenuis, 4%), white seaperch (4%) and dwarf perch (Micrometrus minimus, 2%). Abundance by biomass is dominated by white croaker (39%) followed by black perch (Embiotoca jacksoni), California halibut, white seaperch, and queenfish which together accounted for 26% of the total biomass.

Considerable variation in abundance and diversity parameters occurred in the Cabrillo area. Clustering of juvenile-adult species based on abundance in each sample produced five distinct species groups discussed in SCOSC (1980). Results of the egg and larvel sampling in the Cabrillo area show that the site is used for spawning and especially as a nursery area by a variety of fish species. The nursery function continues to be important into the juvenile stage as evidenced by the large proportion of juveniles in the juvenile-adult samples. The 20 most numerically abundant species collected at Cabrillo (Table I.3-17) represented 98.5% of the total catch; juveniles comprised over 82% of the individuals (SCOSC, 1980). Several species shown in Table I.3-17 (northern anchovy, California grunion, arrow goby, topsmelt, and calico rockfish) were found to occur as 90% to 100% juveniles.

The function of the harbor as a nursery site is supported by the occurrence of 70 taxa with 55.6%, 21.4%, and 4.3% represented by two, three, and four life history stages. Of the 70 taxa collected, 16 species, or 22.9%, were found only as adults (Table I.3-18). With four stages present for northern anchovy, spotted turbot (Pleuronichthys ritteri), and hornyhead turbot (P. verticalis), these nearshore species appear to utilize the harbor as a spawning and nursery area. Larval samples were dominated by northern anchovy (SCOSC, 1980).

The sandy beach site and associated subtidal algal bed support a unique assemblage of adult, juvenile, and larval fish. SCOSC (1980) found that the presence of this habitat most clearly distinguishes the area from other nearshore locations.

vi. Seaplane Anchorage. The Seaplane Anchorage contains similar habitats to those of Cabrillo Beach (SCOSC, 1982; COE, 1984d, p. A-1-137). The fish fauna is abundant, undergoes seasonal fluctuations in abundance and composition, and sustains a relatively high diversity of 1.95 and 2.49 by number and biomass, respectively (SCOSC, 1982). The area appears to be a viable spawning and nursery area for a variety of fish. Several distinctive features of the fish fauna charaterize the area as an inshore habitat:

(1) A large population of California corbina and California halibut that contributed a larger proportion to the total catch in the Seaplane Anchorage area than to the catch in any other harbor area.

(2) Great abundance of gobiids, especially cheekspot goby and bay goby, which were among the 20 most abundant species captured.

Bottom depth, DO, and salinity were the abiotic factors most frequently found to be significant in explaining variation in abundance of common species.

Ichthyoplankton abundance showed marked seasonal variation with peak egg number in January followed by maximum larval number in March (SCOSC, 1982). A late summer/early fall peak in juvenile-adult abundance was similar to trends noted for Cabrillo and other harbor areas.

Diversity values were relatively uniform but species composition changed throughout the year. This pattern of seasonal diversity and similarity is

indicative of a dynamic and robust fish community subject to relatively low levels of environmental stress (SCOSC, 1982). The diversity of the anchorage population was uniformly higher than other harbor locations probably as a result of the close proximity of various fish community habitats. Tables of abundance of juvenile-adult and ichthyoplankton are available elsewhere (SCOSC, 1982; COE, 1984d, pp. A-1-147 to -148).

d. Marine Mammals and Sea Turtles. The occurrence of marine mammals and sea turtles in the harbor is extremely sporadic and infrequent. Marine mammal visitants to the harbor have included the gray whale (Eschrichtius robustus) and the California sea lion (Zalophus californianus) (Seagars, 1985). Other visitants have included common dolphins (Delphinus delphis), Pacific white-sided dolphin (Lagenorhynchus obliquidens), and harbor seals (Phoca vitulina) (COE-L.A. Harbor Department, 1980, p. 35).

On an infrequent basis, the California sea lion has been observed to utilize the outer breakwaters as a temporary stranding spot (Seagars, 1985). The harbor is not a birthing or feeding habitat for the California sea lion (Seagars, 1985). Occasionally, a gray whale may enter the harbor for a short period during the annual migration along the California coastline that occurs from December to April (Fullerton, 1985). The gray whales probably do not feed during their migration; southern California is therefore not an important feeding area (Gaskin, 1982). Hence, the harbor cannot be considered even as a transient habitat of the gray whale.

The green turtle (Chelonia mydas), commonly called the green sea turtle, has been sighted sporadically in the southernmost portion of the harbor region near Alamitos Bay (Fullerton, 1985). These turtles are likely transient individuals far north of their breeding range (Fullerton, 1985; NMFS, 1984).

Table I.3-19 lists the marine mammals and sea turtles that have been sighted in the harbor.

e. Avifauna Associated With Coastal Marine Habitats. The Pacific Coast of North America is a major flyway for north-south bird migration. In addition to migrant birds, Los Angeles-Long Beach Harbors support a small population of year-round residents mainly comprised of western gulls (Larus occidentalis), Heermann's gulls (L. heermanni), ring-billed gulls (L.delawarensis), California gulls (L. californicus), and herring gulls (L. argentatus). Other less numerous species include willet (Catoptrophorus semipalmatus) and black turnstone (Arenaria melanocephala).

The harbor avifauna is characterized by large seasonal fluctuations in both numbers of individuals and species. Figures 3.2.15-12 and 3.2.15-13 show monthly variations in number of species and individuals observed in a 1973-1974 harbor study. Maxima for both categories occur in fall and winter. Abundance decreases from a high of 16,500 in winter to less than 3,000 in late spring and summer. Species numbers reach a high of 45 in winter to 20 in midsummer. The seasonality of species occurrence and abundance reflects the over-wintering function of the harbor (HEP, 1976).

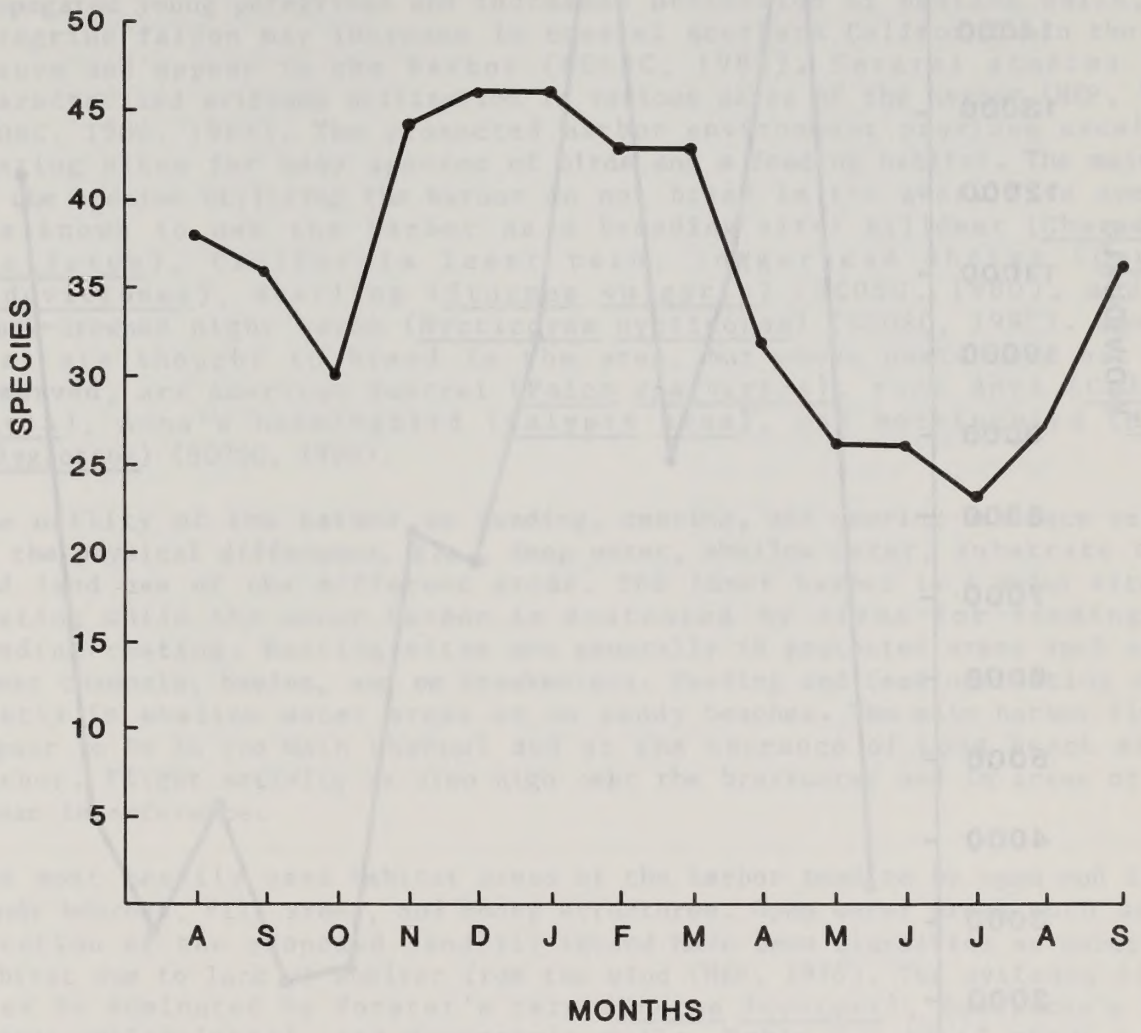


Figure 3.2.15-12 - Monthly Variation (August 1973 - September 1974) in Number of Species of Birds Observed in Los Angeles-Long Beach Harbors (graphic representation of data presented in HEP, 1976)

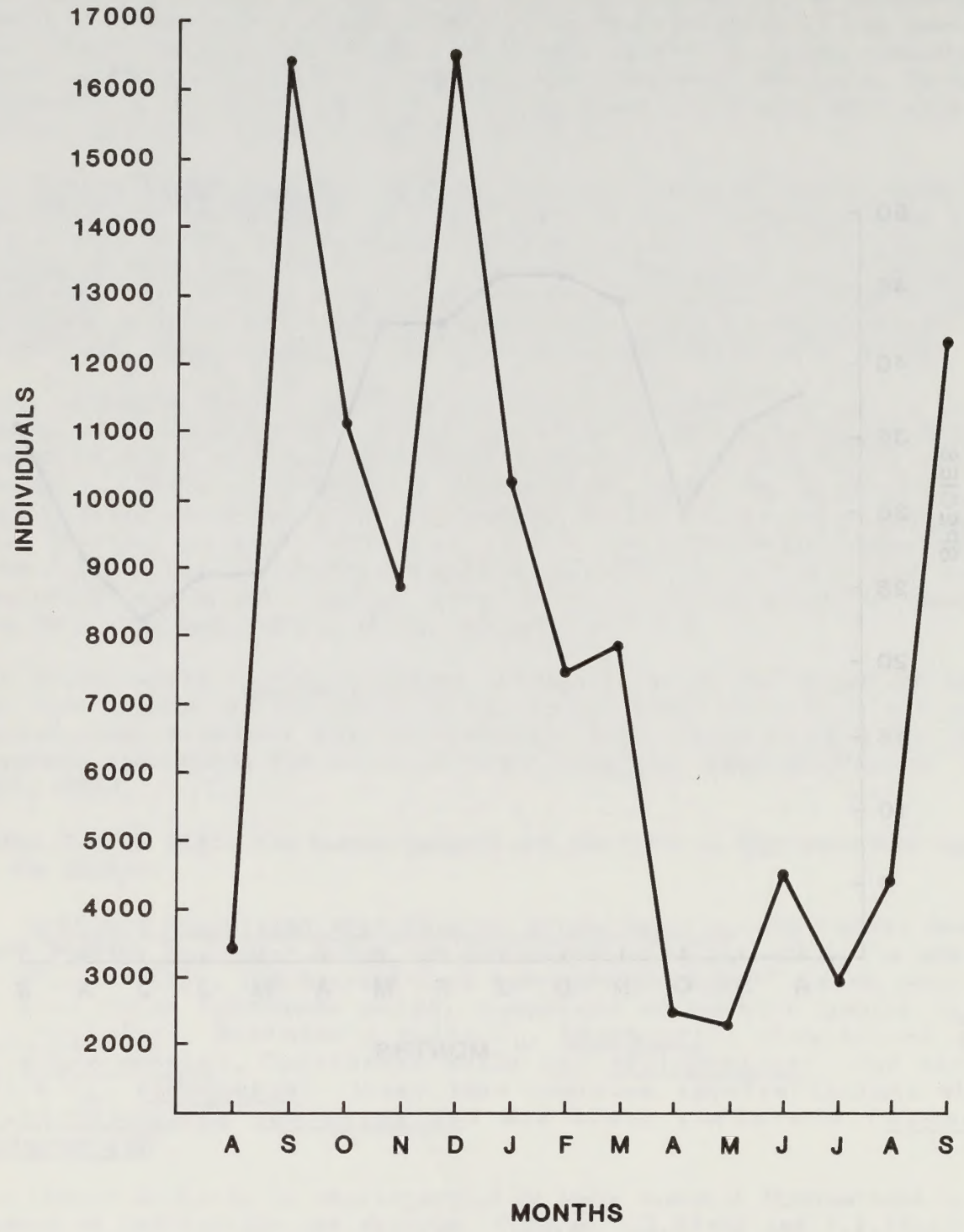


Figure 3.2.15-13 - Monthly Variation (August 1973 - September 1974) in Number of Individual Birds Observed in Los Angeles-Long Beach Harbors (graphic representation of data presented in HEP, 1976)

The Los Angeles-Long Beach Harbors support a large avifaunal population of at least 153 species, including two endangered species, the California least tern (Sterna antillarum browni), and the California brown pelican (Pelecanus occidentalis californicus). The endangered peregrine falcon (Falco peregrinus) has been reported in the harbor (S. Wells and C. Collins, personal observation in SCOSC, 1982) although it has never been recorded during any harbor avifaunal survey. With recent releases of captive propagated young peregrines and increased protection of nesting pairs, the peregrine falcon may increase in coastal southern California in the near future and appear in the harbor (SCOSC, 1982). Several studies have characterized avifauna utilization in various parts of the harbor (HEP, 1976; SCOSC, 1980, 1982). The protected harbor environment provides excellent resting sites for many species of birds and a feeding habitat. The majority of the species utilizing the harbor do not breed in the area. Five species are known to use the harbor as a breeding site: killdeer (Charadrius vociferus), California least tern, loggerhead shrike (Lanius ludovicianus), starling (Sturnus vulgaris) (SCOSC, 1980), and the black-crowned night heron (Nycticorax nycticorax) (SCOSC, 1982). Species that are thought to breed in the area, but whose nests have not been observed, are American kestrel (Falco sparverius), rock dove (Columba livia), Anna's hummingbird (Calypte anna), and mockingbird (Mimus polyglottos) (SCOSC, 1980).

The utility of the harbor as feeding, resting, and nesting habitats relates to the physical difference, i.e., deep water, shallow water, substrate type, and land use of the different areas. The inner harbor is a major site for resting while the outer harbor is dominated by sites for feeding and feeding/resting. Resting sites are generally in protected areas such as the inner channels, basins, and on breakwaters. Feeding and feeding/resting occur mostly in shallow water areas or on sandy beaches. The main harbor flyways appear to be in the main channel and at the entrance of Long Beach middle harbor. Flight activity is also high near the breakwater and in areas of high human interference.

The most heavily used habitat areas of the harbor tend to be open mud flats, sandy beaches, fill areas, and rocky structures. Open water areas such as the location of the proposed landfill island have been classified as suboptimal habitat due to lack of shelter from the wind (HEP, 1976). The avifauna of the area is dominated by Forster's tern (Sterna forsteri), Bonaparte's gulls (Larus philadelphia), and Heermann's gulls. Table 3.2.15-13 shows a list of species associated with open, deep water areas. Open water stations are characterized by relatively few species and low abundance (HEP, 1976). Table 3.2.15-14 presents an overview of four habitat areas in the harbors. Deep water areas such as the landfill site are characterized by the lowest number of species and number of individuals (SCOSC, 1982). A recent study showed that the outer harbor accounted for less than 10% of all birds observed in the harbor (MBC, 1984). Table 3.2.15-15 lists the avifauna observed in the shallow water areas associated with the proposed pipeline crossing.

The California least tern, an endangered species, was once an abundant breeding species along the California coast. Extensive coastal development and recreational use has greatly diminished breeding success. The least

Table 3.2.15-13 - Avifauna Observed in Outer Harbor Stations

American coot	Herring gull
American kestrel	Horned grebe
Arctic loon	Least sandpiper
Barn swallow	Long-billed dowitcher
Belted kingfisher	Loon (Unidentified)
Black-bellied plover	Red-breasted merganser
Black-legged kittiwake	Red-throated loon
Black turnstone	Ring-billed gull
Bonaparte's gull	Ruddy duck
Brown pelican	Ruddy turnstone
California gull	Sanderling
Caspian tern	Spotted sandpiper
Cinnamon teal	Surfbird
Double-crested cormorant	Surf scoter
Eared grebe	Thayer's gull
Elegant tern	Western grebe
Forster's tern	Western gull
Great blue heron	Willet
Heermann's gull	

Source: HEP, 1976; SCOSC, 1982.

Table 3.2.15-14 - Average Number of Species and Individuals in Four Los Angeles-Long Beach Harbors Habitat Areas

Habitat	Species (No.)	Individuals (No.)
Deep water	2.7	9.0
Shallow water	9.8	167.6
Rocky and breakwater	12.3	259.3
Dredge and fill areas	8.37	403.8

Source: SCOSC, 1982; MBC, 1984.

Table 3.2.15-15 - Avifauna Associated with Shallow Water Areas in the Los Angeles-Long Beach Harbors

American crow	Least sandpiper
Barn swallow	Least tern[a]
Belted kingfisher	Lesser scaup
Black-bellied plover	Lesser yellowlegs
Black-crowned night-heron	Oldsqaw
Black oystercatcher	Pelagic cormorant
Black turnstone	Pied-billed grebe
Bonaparte's gull	Red-breasted merganser
Brandt's cormorant	Ring-billed gull
Brown pelican[a]	Royal tern
Bufflehead	Ruddy turnstone
California gull	Sanderling
Caspian tern	Shoveler
Cliff swallow	Spotted sandpiper
Common loon	Surfbird
Double-crested cormorant	Unidentified gull
Eared grebe	Wandering tattler
Elegant tern	Western grebe
Forster's tern	Western gull
Great blue heron	Western sandpiper
Greater yellowlegs	Whimbrel
Heermann's gull	White-winged scoter
Herring gull	Willet
Horned grebe	

[a]Endangered species.
Source: SCOSC, 1982.

tern's nesting activities occur on areas of Terminal Island and the 190-acre landfill. These nesting sites (Figure 3.2.9-1) are approximately 2 miles from the proposed landfill island. The Reeves field nesting site is within 1 mile of the proposed pipeline crossing.

The California least tern is believed to feed entirely on fish (Massey, 1974; Massey and Atwood, 1982, 1984). The least tern is an opportunistic feeder with a diet composed mainly of northern anchovy and lesser amounts of topsmelt and several species of juvenile surfperch (Embiotocidae). Foraging surveys have been conducted on a site-specific basis within the Los Angeles-Long Beach Harbors (Massey and Atwood, 1982, 1984). Although the results of these surveys are not definitive (Fancher, 1985), best available information indicates that foraging usually takes place within 2 miles of the nesting areas (Massey and Atwood, 1982, 1984). The most heavily foraged zone according to the 1984 survey is a 0.10-mi^2 shallow area adjacent to the 190-acre landfill nesting site (Massey and Atwood, 1984, 1985). Outer harbor

and deep water areas appear to be foraged less. The tern, however, as an opportunistic feeder, will feed on schools of forage fish that move between shallow and deep areas (Fancher, 1985). A foraging study will be sponsored by POLA during the 1985 breeding season (April to September) to assess foraging habitat and food preference of the least tern in the Los Angeles-Long Beach Harbors.

The historic loss of nesting and feeding habitat and the disruption of nesting activity by humans no longer appear to be the only major problems for the tern's survival. Heavy predation of eggs and chicks by the American kestrel constitutes a present major problem (Massey and Atwood, 1984).

The California brown pelican (Pelecanus occidentalis californicus) has been declared an endangered species by both the California state and Federal governments. The continued existence of this species was threatened by high concentrations of DDT, DDE, and related residues in the pelican's food chain. DDT and its derivatives are known to upset calcium metabolism, causing the formation of thin egg shells and reduced reproductive potential.

The California population of brown pelicans has been increasing since 1969. This may reflect stringent control of DDT waste disposal. The harbor supports a large population of pelicans that apparently use the outer harbor as a foraging area and the Seaplane Anchorage as a feeding/resting area (SCOSC, 1982). The brown pelican does not nest in the harbors.

2. Benthic Communities. The benthic environment supports a type of marine life that not only lives on, but contributes to and markedly modifies, the character of the bottom. Benthic organisms are involved in a number of sedimentation processes. Benthic organisms may ingest sediment, causing mechanical abrasion of the solid particles and acceleration of the solution of materials such as calcium carbonate (Sverdrup et al., 1942). Ingestion also results in uptake of organic matter. The turning over of superficial layers by mud-eating and burrowing organisms tends to aid in the interchange of the water in the sediment with the overlying water. This results in oxygenation of the deeper layers and enhancement of substrate for bacterial action. Benthic marine organisms are also important as a food source for fish, crabs, and other benthic organisms. They are a vital source of secondary productivity in the harbor trophic schemes.

In the 1950s, some portions of the harbor benthos were devoid of macroscopic animal life due to high organic loading, low DO and anoxic (hydrogen sulfide buildup) conditions (HEP, 1976; COE, 1984d, p. A-1-108). Improvements in water quality and associated massive dredging projects have synergistically aided the establishment of diverse assemblages of benthic animals in previously disturbed inner harbor and channel areas (COE-L.A. Harbor Department, 1980; COE, 1984d, p. A-1-108).

a. Soft Bottom. The soft bottom benthos of the harbor is dominated by ten species shown in Table 3.2.15-16. These polchaetous annelids accounted for 90% of individuals collected. The polychaete Tharyx parvus accounted for 45% of all benthic organisms identified to the species level (HEP, 1976; COE-L.A. Harbor Department, 1980, p. 30).

Table 3.2.15-16 - Ten Numerically Dominant Species from the Los Angeles-Long Beach Harbors Benthos (1973-1974)

Species	Common Name
Tharyx parvus	Polychaetous annelid
Capitita ambiseta = (Mediomastus californiensis)	Polychaetous annelid
Cossura candida	Polychaetous annelid
Capitella capitata	Polychaetous annelid
Paraonis g. oculata	Polychaetous annelid
Euchone limnicola	Polychaetous annelid
Chaetozone corona	Polychaetous annelid
Sigambra tentaculata	Polychaetous annelid
Prionospio cirrifera	Polychaetous annelid
Schistmeringos longicornis	Polychaetous annelid

Source: HEP, 1976.

The soft bottom community of the harbor has been characterized by inner to outer harbor gradients in physical and biological parameters that create discrete faunal zones with distinct species complexes (HEP, 1976). The outer harbor benthos was comprised of two discrete assemblages with some overlapping of species. The outer harbor adjacent to the breakwater was dominated by the polychaetes, Tharyx parvus, Cossura candida, and Hapolscoloplos elongatus. The landward portion of the outer harbor and a station outside the breakwater were dominated by the clams Macoma acolasta and Tellina modesta and the polychaetes Notomastus tenuis and Prionospio pygmaeus. The outer harbor benthic environment is characterized by deep waters, relatively coarse sediments, low levels of pollutants, and low oxygen demands (see subsection 3.2.15.B).

A recent study in Long Beach Harbor (MBC, 1984) characterized an outer harbor station, approximately 500 yards east of the proposed landfill island. The number of individuals and the number of species per 0.1 m^2 was found to be 211 and 55, respectively. Although these values are lower than for the entire Long Beach Harbor, diversity and secondary productivity were comparable and greater, respectively, than the harbor as a whole.

The pipeline crossing areas can be characterized by two studies (SCOSC, 1982; MBC, 1980). SCOSC (1982) sampled the benthos along a transect that closely approximates the pipeline crossing through the Seaplane Anchorage. A total of 180 species of invertebrates and fish was collected. The area was characterized by 46% polychaetes, 21% mollusks, 27% crustaceans, 6% cnidarians, flatworms, nemerteans, phoronids, echinoderms, and 2 species of fish (SCOSC, 1982). By numbers of individuals, the area was 80%, 5%, 15%, and 1%, respectively. The basic community structure prior to the filling of the 190-acre landfill was characterized by polychaetes: Spiophanes missionensis, Prionospio pygmaeus, Mediomastus ambiseta, and Haploscoloplos elongatus and amphipods: Amphdeutopus oculatus and Ampelisca cristata. After filling in 1981, most of the eastern stations were dominated by Cossura candida and were characterized by low species diversity and domination by one species (SCOSC, 1982). Before the stress on the area due to adjacent filling, the anchorage stations had as many as 1,315 individuals and 50 species per 0.1 m^2, respectively (SCOSC, 1982).

The benthic environment of the pipeline crossing area in the Cerritos Channel can be characterized by a study done in the adjacent channel (Berths, 216-218), approximately 1 mile to the west (MBC, 1980). The soft-bottom benthos in this area supported a diverse infaunal community and an abundance of organisms. The most abundant organisms, typical of semihealthy and healthy benthic environments, were the three polychaetes, Cossura candida, Mediomastus californiensis, and Tharyx parvus. This 1980 study showed a change since the 1970s away from polychaete species indicative of semipolluted benthic environments, Capitella capitata and Schistomeringos longicornis. This probably reflects removal of polluted surface sediments through historic dredging activity and improved water quality.

The pattern of benthic distribution, abundance, and diversity may vary over very short distances in the harbor (COE-L.A. Harbor Department, 1980, pp. 30 to 31). The MBC (1980) study found greater diversity and lower abundance at a station contiguous to the two stations characterized above. This was probably due to a difference in sediment grain size.

b. Benthic Side Slope. Relatively new, deep benthic side slope in the outer harbor was likely created after the Harbor Deepening Project. These areas would be located outside of the Main Channel, extending to Angel's Gate with a width of 1,000 ft to 2,500 ft (COE-L.A. Harbor Department, 1980, pp. 30 to 31). After recolonization, the benthic fauna of these areas should be similar to the deep soft-bottom characterized by the polychaetes Tharyx parvus, Cossura candida, and Hapolscolopos elongatus and by the mollusks, Macoma acolasta and Tellina modesta.

Benthic side slope habitat probably exists within 1,000 ft to the west of the proposed landfill island and proposed dredge locations.

c. Contaminated Sediments. The areas of contaminated sediment-benthic habitat in the Los Angeles-Long Beach Harbor are very limited in extent because of the Harbor Deepening Project activities (FWS, 1984). The benthic

environment in the area of the proposed landfill island, dredge locations, and pipeline crossing through the outer harbor and Seaplane Anchorage are all indicative of a clean, healthy environment. The pipeline crossing area in the Cerritos Channel, however, may contain some contaminated sediment-benthic habitat because this area has not been dredged.

d. Benthic Marine Algae, Algal Beds, and Kelp Beds. Marine algae are primary producers, providing a food source for herbivorous invertebrates and fish. With the availability of good light and substrate for attachment, marine algae can develop dense stands providing food and habitat for various marine animals. During two summer studies, 87 species of benthic algae were identified in various harbor locations (HEP, 1976). The algae were dominated by small epiphytic types growing on two species of red algae, Prionitis lanceolata and Gelidium robustum.

The harbor side of the breakwater was found generally to have lower species richness than the ocean side. Higher diversity on the ocean side may be due to lower temperature, increased wave action, and increased circulation (HEP, 1976). The distribution of macroscopic algae showed a gradient of more species and greater coverage from inner to outer harbor to outside the breakwater (COE, 1984d, p. A-1-84). Inner harbor areas were dominated by stress-tolerant species such as Ulva sp. and Enteromorpha spp. with sparse cover. The outer harbor was dominated by red and brown algal species, including Sargassum, Taonia, Gigartina, and Corallina (COE, 1984d, p. A-1-84).

There is no known benthic algal community in the area of the proposed landfill island, dredge location, or pipeline crossing.

Algal beds were common in shallow subtidal areas along the rock embankments of the Main Channel. These beds are dominated by Sargassum. The brown algae Egregia is common in outer harbor areas around Reservation Point, Municipal Warehouse 1, and at Berths 48 to 53. These beds are sometimes attached to pilings. Subtidal algal beds create characteristically well developed assemblages of algae and invertebrates (COE-L.A. Harbor Department, 1980, p. 32).

Two kelp beds have been developed by transplant techniques, one along the San Pedro Breakwater and the other along the middle breakwater. The winter storms of 1977-1978 destroyed most of the beds and additional transplants were placed at the San Pedro site in March 1978 and 1979. The San Pedro kelp bed has had recruitment of juvenile plants during spring, 1978 and 1979, and has spread beyond the orginal transplant area. The bed now extends from the Cabrillo fishing pier to the elbow of the breakwater, and then approximately two-thirds of the distance to the lighthouse. The bed is limited to growth by available light and rocky substrate. Marine organisms typically associated with Macrocystis beds have settled from the plankton into the site. The bed along the federal breakwater was never replaced.

3. Shoreline Communities. The Los Angeles-Long Beach Harbors contain several types of shoreline habitats, including rocky marine areas, riprap and bulkheads, sandy beaches, mud flats and salt marshes, and pilings. The invertebrate communites of these habitats are discussed in this subsection.

These habitats support a diverse population of invertebrates adapted to subtidal and intertidal environments and various types of manmade and natural structures. An attempt at quantifying the size of several shoreline habitats by linear foot or square area is shown in Table 3.2.15-17. Los Angeles Harbor contains a considerable amount of manmade shoreline habitat areas. These are characterized by 99 acres of rocky marine areas, 57 acres of bulkheads, 3,664 lin ft of sandy beaches, and 1,733 lin ft of mud flats. Long Beach Harbor is characterized by 159 acres of rocky marine areas and 42 acres of bulkheads. The piling habitat in the harbor, while a significant habitat in terms of size, is presently unquantified. Figures 3.2.15-14 and 3.2.15-15 provide a key to shoreline habitats in Los Angeles-Long Beach Harbors.

a. Rocky Marine, Riprap, and Bulkhead Habitats. The shoreline habitat of the outer harbor is dominated by the rocky intertidal areas created by manmade breakwaters. This habitat of 258 acres or 24.6 miles is composed of large quarry stones (riprap) or smaller rocks, gravel, or broken concrete (quarry muck). The organisms occupying this habitat include both the resident epifauna and flora (animals and plants attached to the rocks) and cryptofauna (biota hidden among the rocks). The biota on the rocks can also be categorized as overstory (organisms observed from above without disturbing the biota) and understory (organisms beneath the overstory). Numerous fouling and settling species of invertebrates use the rocky areas and other hard substrates, such as floats and pilings, as physical habitats.

A recent study (MBC, 1984) in Long Beach Harbor established zonal classifications for riprap areas. Zone I (the Mid-Intertidal Barnacle Zone) was dominated by the barnacles Chthamalus spp., Balanus glandula (MBC, 1984), and B. amphitrite (COE-L.A. Harbor Department, 1980, p. 27), as well as the limpet Collisella scabra in the outer harbor. The inner harbor Zone I lacked dominance by the limpet.

Zone II (the Low Intertidal Mussel Zone) was dominated by the mussels Mytilus californicus and M. edulis in the outer harbor. The striped shore crab, Pachygrapsus crassipes, inhabited this mussel zone. The inner harbor Zone II was dominated by M. edulis and the anemone Anthopleura elegantissima.

Zone III (the Shallow Subtidal Mussel Zone) was dominated by M. edulis in both the outer and inner harbor stations. Subtidally, mussels are encrusted with bryozoans, sponges, and ascideans. Other invetebrates associated with the subtidal rocky environment include the slipper shells (Crepidula spp.), rock lice (Ligia spp.), the purple urchin (Strongylocentrotus purpuratus), and periwinkles, chitons, and limpets.

In the Long Beach study (MBC, 1984), 506 species of invertebrates were identified. The best represented groups were polychaetes (126 species), arthropods (116 species), mollusks (99 species), and bryozoans (25 species).

Biomass varied among biotic groups, tidal elevations, seasons, and station locations. Mussels comprised the largest biomass in all zones with largest value in the low and high intertidal zone. Barnacles were the second most abundant group by biomass. Mid-intertidal values were highest in the winter

Table 3.2.15-17 - Shoreline Habitat Quantities in Los Angeles-Long Beach Harbors Observed During July 1980

Habitat	Port of Los Angeles	Port of Long Beach
Rocky marine[a]	99 acres (10.6 miles)	159 acres (14.2 miles)
Concrete bulkhead	56 acres (15.2 miles)	19 acres (3.4 miles)
Steel bulkhead	1 acre (591 ft)	24 acres (8.8 miles)
Quarry muck/asphalt-sealed quarry muck	26 acres (3.9 miles)	0
Wood bulkhead	4 acres (1.5 miles)	0
Sandy beach	3,664 ft[b]	0
Mud flat	1,733 ft[b]	0
Piling habitat[c]	-	0

[a]Planar surface area of rocky dikes and breakwater, +3ft MLLW to toe.
[b]It was not possible to convert the linear measurements of gradually sloping substrates (sandy beach and mud flats) into acres because tidal fluctuation was not considered.
[c]Communites inhabiting concrete and wood pilings are important components of the harbor ecosystem; however, because of time constraints, the extent of these habitats were not quantified during this survey.
Source: COE, 1984d, Figure 42.

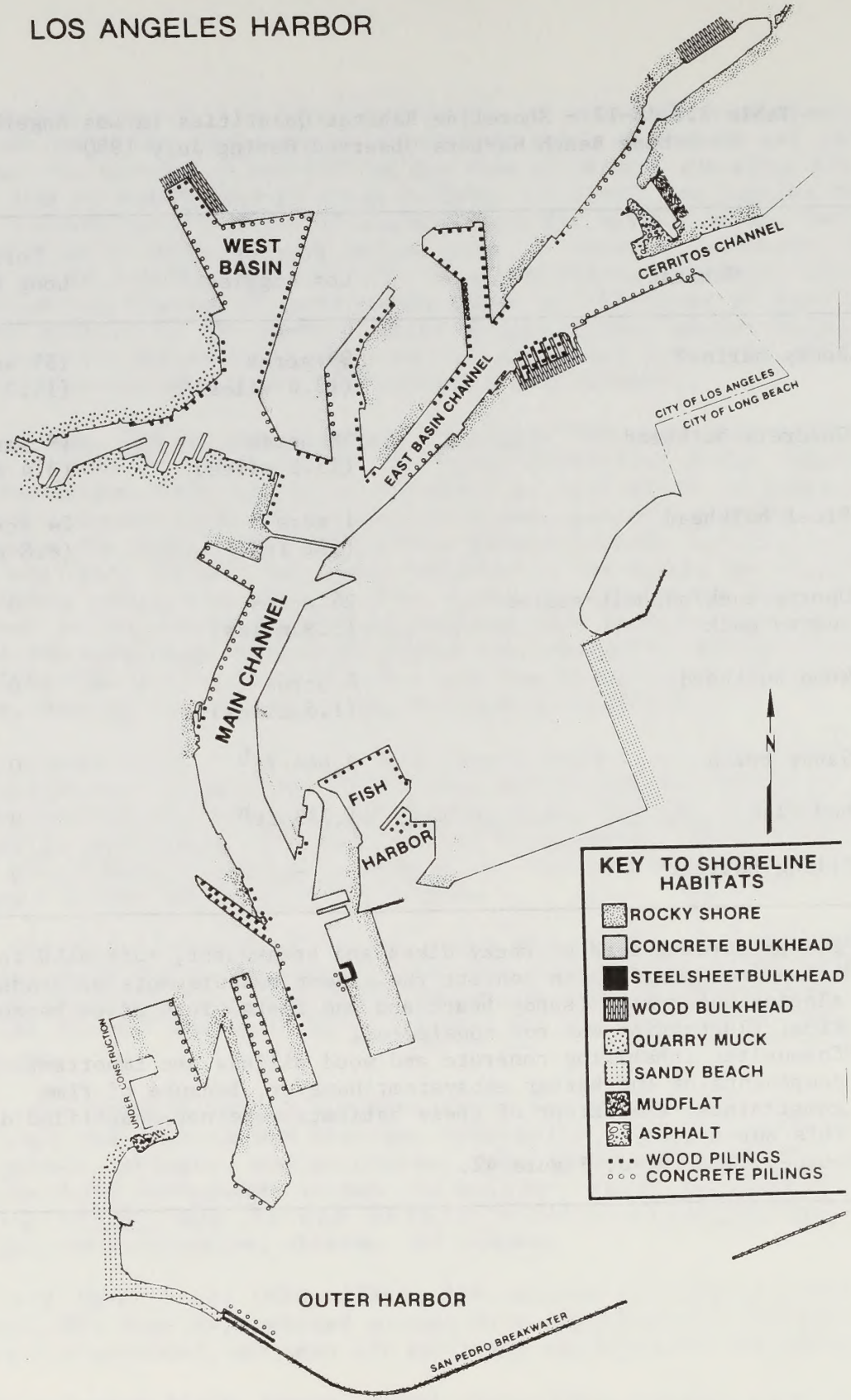


Figure 3.2.15-14 - Shoreline Habitat in Los Angeles Harbor (COE, 1984d, Figure 42)

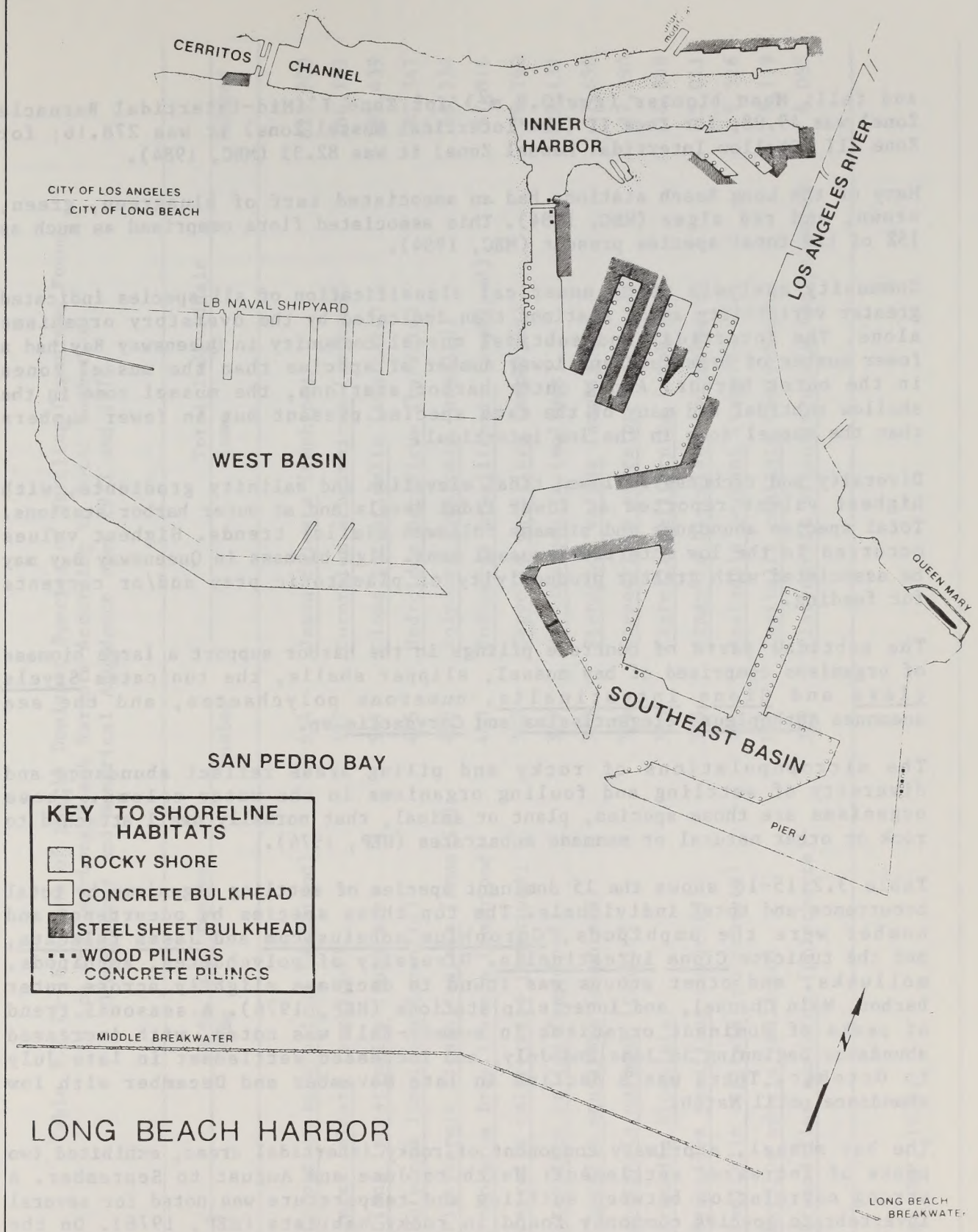


Figure 3.2.15-15 - Shoreline Habitat in Long Beach Harbor (COE, 1984d, Figure 43)

and fall. Mean biomass (gww/0.8 m^2) for Zone I (Mid-Intertidal Barnacle Zone) was 49.08; for Zone II (Low Intertidal Mussel Zone) it was 278.16; for Zone III (Shallow Intertidal Mussel Zone) it was 82.33 (MBC, 1984).

Many of the Long Beach stations had an associated turf of bluegreen, green, brown, and red algae (MBC, 1984). This associated flora comprised as much as 15% of the total species present (MBC, 1984).

Community analysis using numerical classification of all species indicated greater variability among stations than indicated by the overstory organisms alone. The intertidal and subtidal mussel community in Queensway Bay had a fewer number of organisms and lower number of species than the mussel zones in the outer harbor. Among outer harbor stations, the mussel zone in the shallow subtidal had many of the same species present but in fewer numbers than the mussel zone in the low intertidal.

Diversity and richness followed tidal elevation and salinity gradients, with highest values reported at lower tidal levels and at outer harbor stations. Total species abundance and biomass followed similar trends. Highest values occurred in the low intertidal mussel zone. High biomass in Queensway Bay may be associated with greater productivity of planktonic prey and/or currents for feeding.

The subtidal parts of concrete pilings in the harbor support a large biomass of organisms comprised of bay mussel, slipper shells, the tunicates Styela clava and Ciona intestinalis, numerous polychaetes, and the sea anemones Anthopleura elegantissima and Corynactis sp.

The micropopulations of rocky and piling areas reflect abundance and diversity of settling and fouling organisms in the water column. These organisms are those species, plant or animal, that normally dwell attached to rock or other natural or manmade substrates (HEP, 1976).

Table 3.2.15-18 shows the 15 dominant species of settling organisms by total occurrence and total individuals. The top three species by occurrence and number were the amphipods, Corophium acheiusicum and Jassa falacata, and the tunicate Ciona intestinalis. Diversity of polychaetes, amphipods, mollusks, and other groups was found to decrease slightly across outer harbor, Main Channel, and inner slip stations (HEP, 1976). A seasonal trend of peaks of dominant organisms in summer-fall was noted, with increased abundance beginning in June and July, and increased settlement in late July to October. There was a decline in late November and December with low abundance until March.

The bay mussel, a primary component of rocky intertidal areas, exhibited two peaks of increased settlement: March to June and August to September. A strong correlation between settling and temperature was noted for several invertebrate species commonly found in rocky habitats (HEP, 1976). On the basis of biomass, the hydroid Obelia sp. and the tunicate Ciona intestinalis were dominant in the water column; the bryozoans Bugula californica and B. neritina were also occasionally dominant.

Table 3.2.15-18 - Rank of the 15 Dominant Species of Settling Organisms Found in Los Angeles-Long Beach Harbors According to Total Number of Occurrences and Numerical Abundance over 1973 and 1974

Rank	Total Occurrences		Total Individuals	
	Name	Number	Name	Number
1	Corophium acherusicum (amphipod)	654	Jassa falcata (amphipod)	625,900
2	Jassa falcata (amphipod)	597	Cororhium acherusicum (amphpod)	266,102
3	Ciona intestinalis (tunicate)	547	Ciona intestinalis (tunicate)	185,439
4	Polydora limnicola (annelid)	475	Hydroides pacificus (hydroid)	82,347
5	Platynereis bicanaliculata (annelid)	458	Polydora limnicola (annelid)	68,536
6	Podocerus brasiliensis (amphipod)	440	Podocerus brasiliensis (amphipod)	47,516
7	Caprella californica (amphipod)	382	Caprella equilibra (amphipod)	29,260
8	Stenothoe valida (amphipod)	379	Mytilus edulis (mollusk)	28,131
9	Caprella equilibra (amphipod)	378	Stenothoe valida (amphipod)	17,650
10	Anatanais normani (tanoid)	374	Ctenodrilus serratus (polychaete)	17,390
11	Armandia bioculata	368	Caprella californica (anphipod)	16,848
12	Hydroides pacificus (hydroid)	353	Armandia bioculata (polychaete)	15,011
13	Capitella capitata (polychaete)	341	Anatanais normani (tansid)	9,516
14	Mytilus edulis (mullusc)	332	Capitella capitata (polychaete)	8,119
15	Ctenodrilus serratus (polychaete)	319	Platynereis bicanaliculata (polychaete)	6,055

Source: HEP, 1976.

Pilings exhibit vertical gradients in biomass (COE-L.A. Harbor Department, 1980, pp. 27 to 29). At Berth 206 in Cerritos Channel, biomass at -6 ft and -12 ft below the organism at the highest elevation was 1.6 g/cm^2. Biomass decreased at -24 ft to 0.06 g/cm^2. Part of this great difference is due to the shell weight of Mytilus which is included in the wet weight of samples. Clumps of Mytilus shells also provide more surface area and crevices for the attachment of other organisms than bare piling surfaces below their zone of occurrence. At Berth 228 in the Main Channel, the average piling biomass was 5.6 g/cm^2 in 1983 (SCOSC, 1983). At Berth 229 in the Main Channel, the average piling biomass was 0.65 g/cm^2 in 1978. The low biomass value occurred on a piling at the back of the slip. The higher reading involved a piling at the slip entrance showing the potential for increased biomass due to improved circulation (COE-L.A. Harbor Department, 1980, pp. 27 to 29).

Intertidal and subtidal riprap areas provide food and habitat for bird and fish species. The shorebirds and seabirds that utilize the harbor use riprap habitats primarily to rest, but some also feed there (HEP, 1976; MBC, 1984). Many birds such as the brown pelican use riprap areas to rest and use open water to feed. Birds that feed in the riprap commonly prey on small mollusks and crustaceans that they can capture rather than being specific to any particular riprap species. They may prefer the lower intertidal levels because of the high abundance of species and organisms but might feed for longer periods at higher levels where aerial exposure is longer. Potential food availability in terms of number of species and specimens is greater at outer harbor stations (MBC, 1984).

Fish use the riprap as a physical habitat and source of food. Several species such as the midshipman (Porichthys myriaster), smoothhead sculpin (Artedius lateralis), and cabezon (Scorpaenichthys marmoratus) lay their eggs on the rocks, whereas blackeye goby (Coryphopterus nicholsi) and rockpool blenny (Hypsoblennius gilberti) use crevices for protection from predators (MBC, 1984). Fish also feed on barnacles, mollusks, small crustaceans, and crabs.

Figure 3.2.15-16 shows the trophic interactions among outer harbor riprap biota, birds, and fish (MBC, 1984). The riprap serves as a source for a diverse assemblage of primary production, phytoplankton, benthic algae, and detritus, which supports secondary production from omnivorous and herbivorous invertebrates and fish. At the top of the trophic structure, the birds and fish utilize production from the lower levels. The trophic structure is built on both resident and transient biota.

b. Sandy Beach. Sandy beach habitat in the harbor is restricted to Cabrillo Beach, and a relatively new shallow water habitat adjacent to the 190-acre landfill. The inner Cabrillo site is the only extensive, established, and well-studied area. The flora and fauna of the new shallow water habitat are presently uncharacterized. Previous studies of Cabrillo (SCOSC, 1980) were used to characterize the sandy beach habitat.

A total of 40 taxa were collected during three seasonal assessments. Taxa collected in the highest combined abundance, shown in Table 3.2.15-19,

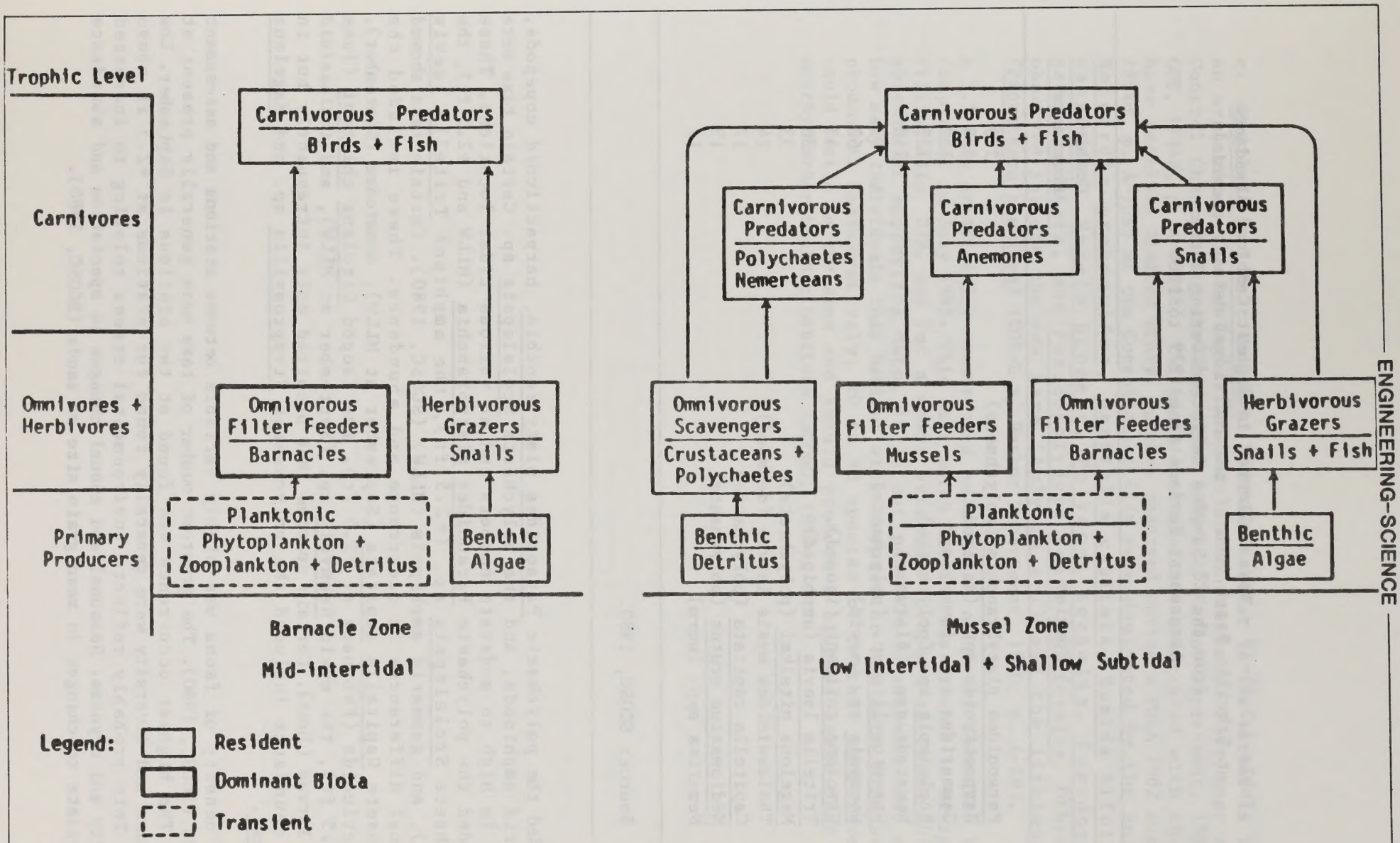


Figure 3.2.15-16 - Trophic Interactions among Outer Harbor Riprap Biota, Birds, and Fish, Port of Long Beach, 1983-1984 (MBC, 1984)

Table 3.2.15-19 - Taxa Collected in Highest Combined Abundance at Cabrillo Beach (sum of the individual density records) from the 28 Samples Collected During Three Assessment Periods from 1979 to 1980

Species	Combined Abundance
Paraonides platybranchia (polychaete)	279
Harpacticoida spp. (copepod)	228
Gammaridea spp. (amphidod)	152
Scolelepis sp. (polychaete)	125
Nematoda spp. (flatworm)	118
Streptosyllis sp. (polychaete)	93
Neomysis sp. (mysid)	63
Cirolana chiltoni (isopod)	43
Tritella laevis (amphipod)	36
Magelona pitelkai (polychaete)	33
Thalassinidea mysis larvae (decapod)	24
Capitella capitata (polychaete)	17
Mediomastus acutus (polychaete)	13
Nemertea spp. (worm)	13

Source: SCOSC, 1980.

included the polychaete Paraonides platybranchia, harpacticoid copepods, gammarid amphipods, and the polychaete Scolelepsis sp. Certain taxa were found in high to moderate numbers and at various tidal locations. These included the polychaete Paranoides platybranchia (MLLW and +2.5 ft), the polychaete Scolelepsis sp, (+2.5 ft), the amphipod Tritella laevis (MLLW), and gammarid amphipods (MLLW) (SCOSC, 1980). Certain taxa showed seasonal differences in occurrence and abundance. These included the polychaete Capitella capitata (September at MLLW), nematodes (September), harpacticoids (February at +2.5 ft), the isopod Cirolana chiltoni (June at +2.5 ft), the mysid Neomysis sp. (September at MLLW), and thalassinid mysid larvae (June). Certain species that occurred only infrequently but in high abundance included the polychaetes Streptosyllis sp. and Magelona pitelkai.

Total density of fauna was highly variable between stations and assessment periods (SCOSC, 1980). The greatest number of taxa were generally present at MLLW. The highest occurrence was found at two stations in September. Low abundance and diversity were generally found for stations at +2.5 ft above MLLW. This probably reflects environmental stress relating to increased salinity and dryness. Seasonal and annual changes in speciation and abundance also relate to changes in mean grain size of sands (SCOSC, 1980).

c. Mudflats and Salt Marshes. Mudflat habitat in the harbor is limited to an area along the Dominguez Channel in Consolidated Slip near the Flood Control Channel and the West Basin (COE-L.A. Harbor Department, 1980, p. 29; COE, 1984d, p. A-1-108). The benthic communities associated with these areas have received limited study. Species observed during a POLA 1982 survey (COE, 1984d, p. A-108) of the Consolidated Slip were dominated by the polychaetes Boccardia proboscidea, Capitella capitata, Eumida bifoliata, E. sanguinea, Nereis procera, Polydora socialis, Pseudopolydora paucibrachiata, and Pseudopolydora kempi californica. Other species observed include the sea hare (Aplysia sp.) and the littleneck clam (Protothaca staminea) (COE-L.A. Harbor Department, 1980, p. A-29).

A 3.5-acre artificially constructed salt marsh at inner Cabrillo Beach was completed in July 1983. This salt marsh habitat was created as mitigation for filling Slip 232, and for a wharf extension project at Berth 206. In the absence of supporting data, it is not possible to estimate what species or how many individuals this habitat will support or how much biomass will be produced. Conservatively, 20 to 30 species of benthic macroinvertebrates could settle in the area and should produce a biomass lower than that for nearby harbor benthic habitats (SCOSC, 1980).

3.3 COACHELLA VALLEY ALTERNATIVE

The environment that would be affected by the 22-mile Coachella Valley Alternative to the Pactex project is described in this subsection. The alternative route is shown on Alignment Map 3 in Appendix J.

3.3.1 AIR QUALITY

The affected environment along the Coachella Valley Alternative would be identical to that of the Pactex described in subsection 3.2.1. Meteorology and background air quality are extremely similar between the two areas.

3.3.2 GEOLOGY AND SEISMIC SETTING

No significant new geologic environment would be encountered by the Coachella Valley Alternative. The only difference of note is that the route at its midpoint would be located 2 to 3 miles further south of the San Andreas fault.

3.3.3 SOILS

The Coachella Valley Alternative route would intersect similar soils of the proposed route, including the Rositas-Carrizo association. Other soils encountered are finer sands, such as the Coachella-Mecca association, a fine sand/silt, and loamy fine sand. These soils are greater than 60 in. in depth and vary from moderately excessive to moderately poor drainage classes. An additional area of dune lands in the vicinity of Indio would also be encountered. The dune lands are comprised of fine sands with greater than 36 in. of depth and are excessively well drained.

3.3.4 SURFACE WATER

The Coachella Valley Alternative route would traverse a similar surface water regime as described for the proposed route. In addition, this alternative would cross the Coachella Canal twice in the vicinity of Indio. The canal brings Colorado River water to the area for use in irrigation.

3.3.5 GROUNDWATER

The alternative would traverse the Coachella Valley, encountering the same groundwater basin as described for the proposed route. No significant difference was found from the proposed route.

3.3.6 FRESHWATER BIOLOGY

The Coachella Valley Alternative would cross the Coachella Canal north of Indio. No perennial stream would be crossed by this proposed alternative. A fisheries study of the lower reaches of the Coachella Canal reported largemouth bass (*Micropterus salmoides*), channel catfish (*Ictalurus punctatus*), and flathead catfish (*Pylodictus olivaris*) as the most common game species (CDFG, 1974).

3.3.7 TERRESTRIAL BIOLOGY

Vegetation types and wildlife species found along the Coachella Valley Alternative would be similar to those along the proposed route. The area is characterized by the blowsand ecosystem of the Coachella Valley. The major sand deposition type is sand hummocks. Vegetation is dominated primarily by creosote bush, burrobush, and saltbush. Sensitive species include the Coachella Valley fringed-toed lizard, flat-tailed horned lizard, Coachella Valley round-tailed ground squirrel, Coachella Valley Jerusalem cricket, flat-seeded spurge, Coachella milkvetch, Little San Bernadino Mountain linanthus, and California ditaxis (see subsection 3.2.7.D). A field assessment of the Coachella Valley alternative route indicates that the route would pass through 0.6 mile (8 acres) of actual occupiable CVFTL habitat. Other potentially occupiable habitat exists along this alternative route but presently lacks all of the characteristics necessary for occupation by the Coachella Valley fringe-toed lizard. Federally designated CVFTL critical habitat does not occur along this alternative route (see Figure 3.2.7-3).

3.3.8 SOCIOECONOMICS

The affected environment would be the same as discussed in subsection 3.2.8.

3.3.9 LAND USE AND RECREATION

The Coachella Valley Alternative would deviate from the proposed route for approximately 22 miles from Garnet until it again follows the proposed Pactex pipeline ROW east of Myoma. Perhaps the most significant land use within this region is the proposed Coachella Valley Fringe-toed Lizard Habitat Conservation Area. The proposed alternative route that would follow the Southern Pacific Railroad and is within the boundary of the Habitat Conservation Plan but outside the Fish and Wildlife Service's designated critical habitat area. Along this alternative route, a mixture of open-space, developed, and agricultural lands exists. Numerous public agencies administer land or exert planning authority over the Coachella Valley. Federal lands administered by the BLM are generally guided by the California Desert Conservation Area (CDCA) Plan (1980). The Aqua Caliente Indian Reservation governs many sections of land along the alternative route. In general, the Aqua Caliente recognize city and county plans for Indian lands, although they reserve ultimate authority. Six cities maintain spheres of influence over land along the Coachella Valley Alternative. With the exception of undeveloped lands, most city lands are designated for development. The county of Riverside has planning authority over all lands in the Habitat Conservation Plan Boundary outside of city and Federal lands. Its main planning document is the Riverside County General Plan.

3.3.10 TRANSPORTATION, ENERGY, UTILITIES, AND PUBLIC SERVICES

The Coachella Valley Alternative would involve two additional crossings of State Highway 111, as well as a crossing of State Highway 195. I-10 would be crossed the same number of times but at different locations. For energy, utilities, and public services, this is no change from the proposed projct.

3.3.11 CULTURAL RESOURCES

There are no known cultural resources along the Coachella Valley Alternative and the potential would be less, apparently, than those of the planned alternative. The alternative alignment has been previously disturbed by railroad and highway construction and lies where no archaeological sites have been reported and where there is less potential.

3.3.12 PALEONTOLOGY

The Coachella Valley Alternative would cross 22 miles of moderately important Quaternary continental deposits. These deposits have the potential for producing late Pleistocene vertebrate remains.

3.3.13 VISUAL RESOURCES

The visual resources along the Coachella Valley Alternative are the same as described for proposed project in subsection 3.2.13. The broad plain of the Coachella Valley with fairly uniform desert vegetation and existing visual intrusions is not designated as an area of high visual sensitivity.

3.3.14 NOISE

The affected environment for noise associated with the Coachella Valley Alternative would be essentially the same as that described for the proposed Pactex route, except that portions of the community of Myoma would be near enough to the corridor to be identified as sensitive noise receptors during construction.

3.3.15 OCEANOGRAPHY AND MARINE BIOLOGY

The Coachella Valley Alternative would have no impact on oceanography or marine resources.

3.4 POLA LANDFILL ISLAND ALTERNATIVE 1

This component alternative involves a smaller landfill island (96 acres) with a dredge depth of -70 ft. The differences from the proposed action in the affected environment are described below. In most resources, no substantive difference (i.e., essentially the same environment) was determined from the proposed island. A detailed project description of this landfill component alternative is found in subsection 2.3.

3.4.1 AIR QUALITY

No substantive difference was found from the proposed project.

3.4.2 GEOLOGIC AND SEISMIC SETTING

No substantive difference was found from the proposed project.

3.4.3 SOILS

Some minor differences in the mix of soils used for fill material might occur because of a slightly decreased channel dredge depth.

3.4.4 SURFACE WATER

No substantive difference was found from the proposed project.

3.4.5 GROUNDWATER

No substantive difference was found from the proposed project.

3.4.6 FRESHWATER BIOLOGY

No substantive difference was found from the proposed project.

3.4.7 TERRESTRIAL BIOLOGY

No substantive difference was found from the proposed project.

3.4.8 SOCIOECONOMICS

No substantive difference was found from the proposed project.

3.4.9 LAND USE AND RECREATION

No substantive difference was found from the proposed project.

3.4.10 TRANSPORTATION, ENERGY, UTILITIES, AND PUBLIC SERVICES

No substantive difference was found from the proposed project.

3.4.11 CULTURAL RESOURCES

The POLA cultural resources are described in subsection 3.2.11 and in various references cited in that subsection. For this alternative, three known sites may be affected. There are no substantive differences for this alternative than in the Pactex proposal. The affected environment (low sensitivity) of the Landfill Alternative 1 would generally encompass a smaller area (483 acres compared to 508 acres) although in the same configuration and location.

3.4.12 PALEONTOLOGY

The Landfill Alternative 1 would impact 25 fewer acres of Quaternary sediments of potentially moderate importance than the proposed project. No other substantive difference was found from the proposed project.

3.4.13 VISUAL RESOURCES

No substantive difference was found from the proposed project.

3.4.14 NOISE

No substantive difference was found from the proposed project.

3.4.15 OCEANOGRAPHY AND MARINE BIOLOGY

No substantive difference was found from the proposed project.

3.5 POLA LANDFILL ISLAND ALTERNATIVE 2

This component alternative involves a fully diked, 170-acre island with a dredge depth of -75 ft. The differences from the proposed project in the affected environment are described below. In most resources, there is no substantive difference from the proposed action, i.e., essentially the same environmental setting would be affected. A detailed project description of this component alternative is found in subsection 2.3.

3.5.1 AIR QUALITY

No substantive difference was found from the proposed project.

3.5.2 GEOLOGIC AND SEISMIC SETTING

No substantive difference was found from the proposed project.

3.5.3 SOILS

Some minor differences in soils would be associated with the greater volume of fill required for the 170-acre landfill island (versus 115 acres for the proposed project).

3.5.4 SURFACE WATER

No substantive difference was found from the proposed project.

3.5.5 GROUNDWATER

No substantive difference was found from the proposed project.

3.5.6 FRESHWATER BIOLOGY

No substantive difference was found from the proposed project.

3.5.7 TERRESTRIAL BIOLOGY

No substantive difference was found from the proposed project.

3.5.8 SOCIOECONOMICS

No substantive difference was found from the proposed project.

3.5.9 LAND USE AND RECREATION

No substantive difference was found from the proposed project.

3.5.10 TRANSPORTATION, ENERGY, UTILITIES, AND PUBLIC SERVICES

No substantive difference was found from the proposed project.

3.5.11 CULTURAL RESOURCES

Cultural resources are described in subsection 3.2.11. Although the affected environment of this alternative generally encompasses the same area as the preferred project (508 acres), there will be an additional impact of one site because of the different landfill configuration. Landfill Alternative 1 (483 acres) would reduce potential impacts because it has a smaller area.

3.5.12 PALEONTOLOGY

No substantive difference was found from the proposed project.

3.5.13 VISUAL RESOURCES

No substantive difference was found from the proposed project.

3.5.14 NOISE

No substantive difference was found from the proposed project.

3.5.15 OCEANOGRAPHY AND MARINE BIOLOGY

No substantive difference was found from the proposed project.

SECTION 4
ENVIRONMENTAL CONSEQUENCES

SECTION 4

ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

Section 4 presents a discussion of the environmental consequences that would result from implementing the Pactex proposal or alternatives. In keeping with NEPA and CEQA guidelines, this section focuses on the impacts that are considered significant. The general approach followed throughout this section is to describe briefly the range of impacts that would occur and then provide a detailed discussion of those impacts that are considered significant. As appropriate, additional detail was also included for those impacts identified as issues during the scoping process and in the responses to the Notice of Preparation.

4.2 PACTEX PROPOSAL

The environmental consequences of the Pactex proposal on each resource area are reviewed and analyzed in this section.

4.2.1 AIR QUALITY

A. Introduction

This subsection details the information concerning the emissions and impacts of air pollutants resulting from the construction and operation of the Pactex marine terminal and pipeline. The project components are described in subsection 2.2. System components and associated air emissions and air quality impacts are described in this subsection. Air emissions from berthing, offloading oil, and transit operation would be expected. These emissions would be generated primarily during combustion of fuels in the ships' boilers. Pumps, valves, etc., at the marine terminal metering system would be potential sources of hydrocarbon emissions.

B. Construction Emissions

The major significant emission sources during construction of the proposed project would be fugitive dust and construction equipment exhaust emissions associated with excavation activities (i.e., grading, filling, and clearing of land). Exhaust emissions would include carbon monoxide (CO), sulfur oxides (SO_x), nitrogen oxides (NO_x), hydrocarbons (HC), and suspended particulates (TSP). Dust (particulate emissions) would be generated during earthmoving, filling, and grading. Significant emissions were calculated for these activities using EPA AP-42 emission factors (EPA, 1977). Significant emissions from construction activities would occur only during the daily working hours for the duration of the construction phase of the project. A construction schedule and estimated time to complete is shown in Appendix A. Emissions per construction event were calculated from this information. The following subsections develop and present the construction emissions for POLA's marine terminal/port facilities, the pipeline, and the Midland terminal.

Total estimated construction emissions for the marine terminal and port facilities (offshore civil construction, the berth and metering facilities, and the offshore tank farm) are presented in Table 4.2.1-1. Fugitive dust emissions from grading, filling, and earthmoving were calculated using an AP-42 emission factor of 1.2 tons of particulates per acre-month. Pactex is planning to use 0.05 weight-percent sulfur bearing fuel in all diesel equipment operated in California. Diesel fuel at 0.25 weight-percent or less would be used in construction equipment operated in Arizona, New Mexico, and Texas. Emissions from offshore construction, berth construction, and the storage terminal would be caused by heavy-duty diesel construction equipment. Specific input regarding equipment type, engine sizes, fuel usage, emission factors, and scheduling is contained in Appendix A.

1. Clearing and Grading ROW. Emissions from the clearing and grading operations would include combustion exhaust from heavy-duty construction equipment and particulate matter from earthmoving activities.

2. Hauling and Stringing Line Pipe. Emissions from pipe-stringing trucks and dust from rock blasting would occur during this activity.

Table 4.2.1-1 - POLA Area: Emissions Inventory[a] for Construction Phase of Pactex Facility

Activity	Emissions (tons)				
	CO	HC	NO_x	SO_2	Part.
Offshore civil construction	16.7	6.2	46.1	1.1	5.4
Berth and metering	6.5	2.2	16.7	0.4	2.1
Terminal	15.4	5.1	36.7	0.9	4.4
Fugitive dust[b]	0.0	0.0	0.0	0.0	207.0

[a]See Appendix A for emission calculations, schedules, and assumptions.
[b]115 acres disturbed for 3-month construction period.
Source: EPA, 1977; Pactex, 1983b.

3. Ditching. Significant combustion emissions from operation of backhoes, power shovels, and fugitive dust generated from blasting and moving soils would result from these activities.

4. Lowering and Tying-in. Exhaust emissions from the tractors would be expected from this activity.

5. Backfilling. Significant fugitive emissions from earthmoving filling and exhaust from the motor graders, etc., would occur during this activity. Fugitive dust emissions for the above-mentioned construction activities were calculated using an aggregate fugitive dust emission factor of 1.2 tons per acre of construction per month of activity (EPA, 1977) and assuming that the disturbed area would be limited to a 5,000-ft length at any one time. The width of the disturbed area would be equal to 100 ft. Fugitive dust emission calculations are shown in Appendix A.

The emissions associated specifically with pipeline construction are presented in Table 4.2.1-2. These emissions are broken down into four segments:

(1) Delivery pipelines - berths to terminal to Los Angeles River.

(2) Los Angeles River to Beaumont, California (including the Rialto pump station).

(3) Beaumont, California, to Blythe, California (including the Blythe pump station).

Table 4.2.1-2 - Pipeline Route: Emissions Inventory[a] for Construction Phase

Segment	Emissions (tons)				
	CO	HC	NO_x	SO_2	Part.[b]
South Coast Air Basin					
POLA to Los Angeles River	31.9	7.9	51.5	1.3	73.5
Los Angeles River to Beaumont (including one pump station)	57.8	16.6	115.9	3.0	1,760.0
Southeast Desert Air Basin					
Beaumont to Blythe (including one pump station)	131.4	19.9	94.0	2.4	3,184.5
Air Quality Control Regions Outside California					
Blythe to Midland (including eight pump stations)	731.0	111.3	527.7	51.5	17,615.1

[a]See Appendix A for emission calculation assumptions.
[b]Includes fugitive dust from disturbed areas; assumes BACT on construction equipment exhaust and 50% control of fugitive particulates from disturbed areas.
Source: EPA, 1977; Pactex, 1983b; ES, 1985.

(4) Blythe, California, to Midland, Texas (including the Livingston, Gila, Coolidge, Redington, Lordsburg, Akela, Hueco, and Jal pump stations).

Construction emissions for the Blythe to Midland portion were extrapolated from the Beaumont to Blythe calculated emissions by assuming that the emissions are directly proportional to the distance.

6. Midland Storage and Transfer Terminal. Construction emissions were calculated assuming that emissions were identical to those at the southern California tank farm. This is a worst-case assumption because the proposed Pactex terminal would have a capacity of approximately 5.6 million barrels compared to the Midland terminal capacity of 4.2 million barrels. These emission values are presented in Table 4.2.1-3.

Table 4.2.1-3 - Midland Terminal: Emissions Summary for Construction Phase

Emissions (tons)[a]				
CO	HC	NO_x	SO_2	Part.[b]
15.4	5.1	36.7	3.5	184.4

[a]These emissions are assumed to be the same as the POLA terminal construction. Total emissions for this activity.
[b]Includes fugitive dust emissions, see calculations in Appendix A.
Source: EPA, 1977; Pactex, 1985.

C. Construction Impacts. The Industrial Source Complex (ISC) short-term dispersion model was selected to calculate ambient air quality impacts resulting from construction activities. This model was chosen because of its ability to simulate emissions from continuous sources such as ships smokestacks and finite line sources from construction of the crude oil pipeline. The model can also be used to simulate fugitive emissions from nontraditional sources such as windblown dust and re-entrained road dust.

The line source option of the ISC model was selected to estimate impacts due to construction activities along the pipeline route. The line source calculation scheme is an appropriate method for determining impacts associated with the construction of the pipeline from POLA to Midland for the following reasons:

(1) Emissions would be emitted at a constant rate along the construction path (assumed to be a straight line).

(2) The line source algorithm yields conservative results (i.e., the model tends to overpredict ground level concentrations) so there is a margin of safety incorporated in the approach.

(3) The worst-case impacts using a line source occur with a wind direction parallel to the length of the pipeline. This assumption would be very conservative over a 24-hour period. Using the area source algorithm in ISC would probably not provide the same degree of conservation. Construction emissions were assumed to be distributed over a 5,000- by 100-ft rectangular area. The volume source option of the ISCST model was used. Fifty boxes were aligned next to each other to simulate the construction emissions. Each box was 100 ft long, 100 ft wide, and 33 ft high. Receptors were placed parallel to the line source at intervals of 328 ft.

To determine the realistic worst-case groundlevel concentration impacts from construction activities along the entire pipeline route, a 24-hour weather scenario was developed that was likely to be experienced in a semiarid and/or desert environment. Table 4.2.1-4 shows the model input used in the calculations. Because the construction workers would be working in the early morning hours, maximum 1-hour air quality impact conditions would occur during stable (i.e., little horizontal or vertical dispersal of pollutants), low wind speed conditions (1 m/s). These stable conditions would last only during the first two hours of the working day. The remaining hours would probably be unstable to neutral. Under worst-case assumptions, the remaining hours were selected to be neutral. Unstable conditions would provide greater dilution and dispersion of emissions, and associated air quality impacts would be less than predicted by the model. Because construction crews would be working in any area for about 10 days, air quality impacts from construction might be intense for a very short period of time. Table 4.2.1-2 summarizes those areas that could be subject to short-term impacts during construction. Furthermore, wind directions were assumed to be invariant over time and parallel to the pipeline segment (a very conservative assumption). Parallel winds are representative of worst-case conditions for a line source.

Maximum 24-hour concentrations were computed assuming 2 hours of stable conditions and 7 hours of neutral conditions. The remaining 15 hours would have no effect on the 24-hour average concentrations because of the planned 9-hour workday.

For modeling purposes, the 5,000-ft-long line source was assumed to have a normalized emission rate of 1 g/s. Since air quality concentration impacts are directly proportional to emission rate, concentrations for each pollutant were then computed by using the ratio of the actual emissions to this normalized emission rate. The results of the construction modeling for each pipeline segment are shown in Tables 4.2.1-5 through 4.2.1-9.

Construction emissions generated in Table 4.2.1-2 were used to determine the maximum NO_2, SO_2, TSP, and CO impacts caused by construction of the pipeline from POLA to Midland. As seen from Tables 4.2.1-5, -6, -7, -8, and -9, contributions were well within ambient air quality standards promulgated by the Federal government. Maximum 24-hour PM_{10} concentrations are expected to be within the State of California 50 ug/m^3 standards. Because emissions

Table 4.2.1-4 - Meteorological Data Used in the Construction Modeling[a]

Hour	Wind Direction (degrees)	Stability Category[b]
1	90.0	F
2	90.0	E
3	90.0	D
4	90.0	D
5	90.0	D
6	90.0	D
7	90.0	D
8	90.0	D
9	90.0	D
10	90.0	D
11	360.0	D
12	360.0	D
13	360.0	D
14	360.0	D
15	360.0	D
16	360.0	D
17	360.0	D
18	360.0	D
19	360.0	D
20	360.0	D
21	360.0	D
22	360.0	D
23	360.0	D
24	360.0	D

[a]The following variables were kept constant for all hours: wind speed = 1.0 m/s, mixing height = 999.0 m, and temperature = 293.0°K.

[b]F stability = very stable, poor dispersion of pollutants.
E stability = slightly stable, moderately poor dispersion of pollutants.
D stability = neutral stability, pollutant dispersion neither enhanced or retarded.

Source: ES, 1985.

Table 4.2.1-5 - POLA to Banning: Summary of Air Quality Impacts Resulting from Construction of the Pactex Pipeline (ug/m^3)

Pollutant	Maximum Concentration		Total Ambient Concentration	State/Federal Standard[a]
	Project	Background (Station)		
Carbon monoxide				
1 hr	198	35,433 (Lynwood)	35,631	23,000
8 hr	173	28,918 (Lynwood)	29,091	10,000
Nitrogen dioxide				
1 hr	196	695 (Long Beach)	891	470
24 hr	NA	NA	NA	NA
Sulfur dioxide				
1 hr	14	263 (Long Beach)	277	1,310
24 hr	5.1	83 (Lynwood)	88	131
Total suspended particulates				
24 hr	54	380 (Redlands)	434	100 50[b]

[a]When both Federal and state standards exist, only the most stringent standard is presented.
[b]State of California standard for particulate matter less than 10 microns (PM_{10}).
NA = not applicable.
Source: ES, 1985; Pactex, 1983b.

Table 4.2.1-6 - Banning to Blythe: Summary of Air Quality Impacts Resulting from Construction of the Pactex Pipeline (ug/m^3)

Pollutant	Maximum Concentration			State/Federal Standard[a]
	Project	Background (Station)	Total Ambient Concentration	
Carbon monoxide				
1 hr	198	8,001 (Palm Springs)	8,199	23,000
8 hr	173	4,343 (Palm Springs)	4,516	10,000
Nitrogen dioxide				
1 hr	196	300 (Palm Springs)	496	470
24 hr	NA	NA	NA	NA
Sulfur dioxide				
1 hr	14	26 (Palm Springs)	40	1,310
24 hr	5.1	26 (Palm Springs)	31	131
Total suspended particulates				
24 hr	54	305 (Indio)	359	100 50[b]

[a]When both Federal and state standards exist, only the most stringent standard is presented.
[b]State of California standard for particulate matter less than 10 microns (PM_{10}).
NA = not applicable.
Source: ES, 1985; Pactex, 1983b.

Table 4.2.1-7 - Arizona: Summary of Air Quality Impacts Resulting from Construction of the Pactex Pipeline (ug/m^3)

Pollutant	Maximum Concentration		Total Ambient Concentration	State/Federal Standard[a]
	Project	Background (Station)		
Carbon monoxide				
1 hr	198	19,431 (Phoenix)	19,629	40,000
8 hr	173	11,430 (Phoenix)	11,603	10,000
Nitrogen dioxide				
1 hr	NA	NA	NA	NA
24 hr	NA	NA	NA	NA
Sulfur dioxide				
1 hr	NA	NA	NA	NA
24 hr	5.1	83 (Phoenix)	88	365
Total suspended particulates				
24 hr	54	348 (Phoenix)	402	150

[a]State Ambient Air Quality Standards in Arizona are identical to the NAAQS.
NA = not applicable.
Source: ES, 1985; Pactex, 1983b.

Table 4.2.1-8 - New Mexico: Summary of Air Quality Impacts Resulting from Construction of the Pactex Pipeline (ug/m^3)

Pollutant	Maximum Concentration: Project	Maximum Concentration: Background (Station)	Total Ambient Concentration	State/Federal Standard[a]
Carbon monoxide				
1 hr	198	14,859 (Las Cruces)	15,057	14,970
8 hr	173	7,201 (Las Cruces)	7,374	9,940
Nitrogen dioxide				
1 hr	NA	NA	NA	NA
24 hr	74	75 (Anthony)	149	188
Sulfur dioxide				
1 hr	NA	NA	NA	NA
24 hr	5.1	26 (Lordsburg)	31	261
Total suspended particulates				
24 hr	54	470 (Anthony)	524	150

[a]When both Federal and state standards exist, only the most stringent standard is presented.
NA = not applicable.
Source: ES, 1985; Pactex, 1983b.

Table 4.2.1-9 - Texas: Summary of Air Quality Impacts Resulting from Construction of the Pactex Pipeline (ug/m^3)

Pollutant	Maximum Concentration: Project	Maximum Concentration: Background (Station)	Maximum Concentration: Total Ambient Concentration	State/Federal Standard[a]
Carbon monoxide				
1 hr	198	28,918 (El Paso)	29,116	40,000
8 hr	173	17,945 (El Paso)	18,118	10,000
Nitrogen dioxide				
1 hr	NA	NA	NA	NA
24 hr	NA	NA	NA	NA
Sulfur dioxide				
1 hr	NA	NA	NA	NA
24 hr	5.1	340 (El Paso)	345	365
Total suspended particulates				
24 hr	54	402 (Odessa)	456	150

[a]State Ambient Air Quality Standards in Texas are identical to the NAAQS.
NA = not applicable.
Source: ES, 1985; Pactex, 1983b.

from construction activities are primarily in a size range larger than 10 microns. The maximum 24-hour particulate matter concentration predicted by ISC was 54 ug/m^3. However, the existing background concentrations violate the carbon monoxide, nitrogen oxide, and particulate standards in the Los Angeles basin. The background concentration also violates the Federal/state TSP standard (24-hour) in Arizona, New Mexico, and Texas (Tables 4.2.1-7, -8, and -9).

D. Operational Emissions

The operation and use of terminal/storage facilities and pipeline would result in the emission of air pollutants at several locations. This includes emissions from tanker transit into and out of the port area, significant emissions from transfer and crude offloading operations, and from the floating roof storage tanks at the Los Angeles Harbor and Midland terminals. Employee transit and onsite mobile sources would also contribute to the total emissions in the terminal storage area. Operational emissions have been separated into two areas: POLA emissions and the Midland terminal emissions. Operational emissions associated with 11 pump stations along the pipeline route would be negligible because of the use of electric motor-driven pumps. Emissions associated with power generation sufficient to operate the pumps would be negligible (Table 4.2.1-10). Emissions from each area are described in the following scenario.

1. POLA Operations. Potential air pollutant emissions resulting from the operation of the project would include:

(1) Tanker (boiler) emissions during propulsion within SCAQMD waters, hoteling, and cargo discharge within the port and berth area.

(2) Tugboat emissions.

(3) Crude oil storage tank emissions.

Table 4.2.1-10 - Emissions From Power Plants Generating Electricity for Pump Stations in California

Pump Station	Emissions lb/day				
	CO	HC	NO_x	SO_2	Part.
Wilmington	75.1	46.6	751.7	501.1	64.3
Rialto	75.1	46.6	751.7	501.1	64.3
Blythe	45.1	27.8	451.0	300.7	38.6

Source: SCAQMD, 1983.

(4) Vehicular emissions from workers' automobiles and service trucks.

(5) Fugitive emissions from pumps, valves, and flanges.

a. Tanker Emissions. Although Pactex does not own or operate any tankers, those calling at the berths would be required to comply with all Federal, state, and port regulations applicable to their design and operation. Furthermore, Pactex intends to stipulate in its tariffs that tankers delivering crude oil for shippers must comply with these requirements before the shippers' crude oil is acceptable for shipment through the pipeline. Tankers are assumed to be fitted with segregated ballast tanks and inert gas systems to reduce air emissions during unloading and ballasting. Tankers would also be required to burn bunker fuel containing 0.25% by weight or less sulfur content within SCAQMD jurisdiction, a small quantity of ROG will be emitted during offloading.

To determine the number of berths and inland storage tank requirements, an estimate has been prepared of the numbers of tankers by size groups or classes. The estimate is largely based on tankers loading regularly at Valdez Terminal, Alaska, plus a review of other potential tanker routes. Using the proposed tanker mix and size characteristics, scheduling and weather factors between Los Angeles Harbor and Valdez, it was determined by Pactex and the SCAQMD that worst-case 24-hr emissions would occur when two 165,000-dwt tankers are in port offloading crude oil simultaneously. Average daily emissions were based on the total number of ship calls for each class of ship per year and average daily fuel consumption rates.

The estimated fuel consumption rates for the various operating modes involved in a 165,000-dwt tanker visiting the POLA are shown in Table 4.2.1-11.

Table 4.2.1-11 - 165,000-dwt Tanker Fuel Consumption Rates[a]
(long ton[b]/hr/ship)

Use	Fuel Consumed
Approach	1.5
Offloading	1.0
Idling	6.34
Departure	0.53

[a]Fuel consumed per tanker. Total worst-case 24-hour scenario fuel consumption for two tankers is 9.37 long ton/hr.
[b]Long ton = 2,240 lb.
Source: SCAQMD, 1984b; Pactex, 1983b.

The projected time estimates for approach, offloading, idling, and departure within SCAQMD jurisdictional limits for the maximum 24-hour fuel consumption rates (Pactex, 1983) are presented below. Durations between the two berths are slightly different because of pumping capacities.

Two 165,000-dwt Tankers	Duration (hr)
Berth 1	
Approach from 3 miles in	1.5
Offloads	12.0
Idles	4.0
Departs to 3 miles out	1.0
Total	18.5
Berth 2	
Approach from 3 miles in	1.5
Unloads	12.5
Idles	4.5
Departs to 3 miles out	1.0
Total	19.5

Maximum fuel consumption rates and projected time estimates for transit into and out of the port, unloading, etc., were used to calculate emission estimates for the worst-case 24-hour tanker operating scenario.

b. Tugboat Emissions. Tugboat assistance may sometimes be required depending on the judgment of the port pilot. Berthing for a 165,000-dwt tanker would require less than 4 hours of tug assistance. A maximum of 2 hours of tug assistance would be needed for deberthing. Up to four tugboats could be required for berthing, whereas only two would be required for deberthing. Tugboat emission calculations were based on two berths each accepting only one 165,000-dwt tanker as a maximum 24-hour operation. Based on the above assumptions, the total tugboat use requirements would be 12 tugboat-hours/day.

c. Crude Oil Storage Tank Emissions. Eight external floating roof crude oil storage tanks are proposed in the POLA, including two 950,000-barrel tanks, two 800,000-barrel tanks, two 675,000-barrel tanks, and two 375,000-barrel tanks. Roof seals would be liquid-mounted, resilient seals with rim-mounted secondary seal. In normal operation, the roofs would be maintained in a floating condition. Eight floating roof storage tanks at a capacity of 500,000 barrel each would be constructed at the Midland terminal. Three existing tanks with a capacity of 80,000 barrel each may also be used for storage.

Handling the 900,000 bpd through the POLA storage tanks, with total working capacity of approximately 5,600,000 barrels, would require an average of 55.7 times per year when each tank is filled, then emptied. This equates to one cycle every 6.6 days. The total annual throughput for all tanks is 32,850 million barrels. The total working capacity of the Midland storage terminal, approximately 4,216,000 barrels, would require an average of 57 times per year when each tank is filled, then emptied.

A variety of crude oil grades is expected, with Alaskan North Slope crude providing the major portion. Other crude oils may include U.S. west coast offshore crude oils that have not as yet been identified and analyzed, as well as foreign crude oils from such areas as Indonesia. Any crude oil accepted at the port facility must have a vapor pressure of less than 11.0 pounds per square inch absolute (psia) to ensure compliance with SCAQMD VOC emission requirements.

Fugitive standing storage and withdrawal hydrocarbon emissions were calculated using standard emission factors (EPA, 1977). Storage tank calculations are presented in Appendix A.

d. Vehicular Traffic Emissions. There is no plan or need for heavy machinery equipment to be present at the marine terminal during the normal operations of the facilities. Other motor-driven vehicular activities associated with the marine terminal operations are:

(1) Vehicular Traffic Associated with Employees: It is estimated that a maximum of 48 Pactex employees would be needed at the POLA marine terminal and at other facilities in the Los Angeles area. The total number of employees at Midland is estimated to be 30.

(2) Vehicular Truck Traffic Serving the Tankers: The tanker crew transportation activities and tanker services-related traffic activities would not be expected to be significant because no bunkering, crew charges, or supplies/stores activities would be done at the Pactex berths.

(3) Emissions from Service Boats Used to Transfer Personnel from the Shoreline to the Island Terminal. The service boats that transfer personnel and supplies to the island terminal would not be expected to have significant emissions because of the small ship size and small number of trips involved.

e. Total Operational Emissions. Total operational emissions associated with the worst-case 24-hour assumptions presented previously are shown in Table 4.2.1-12. Average daily operational emissions for the project are presented in Table 4.2.1-13.

Estimates for average emissions (900 thousand bpd) were based on the average fuel consumption per tanker activity for each size class of tanker during a single visit to the port. Annual fuel consumption was obtained for each tanker class by multiplying the average consumption per visit by the number of visits for each tanker class. Average fuel consumption per visit and

Table 4.2.1-12 - Summary of Emissions for 24-hour Worst-Case Operating Scenario[a]

Emission Activity	Emissions (lb/day) ROG	NO_x	SO_2	CO	Part.
Propulsion	14	414	134	74	55
Operational					
Without air pollution controls	69	1,877	1,566	982	577
With air pollution controls[b]	7	188	157	98	173
Fugitive emissions	17	0	0	0	0
POLA storage tanks	192	0	0	0	0
POLA terminal fugitive emissions	17	0	0	0	0
Employee vehicular traffic	3	9	1	41	1
South Coast Air Basin Total (with air pollution controls)	253	611	292	213	229
Midland terminal storage tanks	218	0	0	0	0

[a]See Appendix A for emission calculations. Each activity includes 17% reduction because of inerting system; 90% reduction efficiency for NO_x and SO_2; 70% reduction efficiency for particulates.
[b]90% NO_x removal, 90% SO_2 removal, 70% Part. removal, 90% ROG removal, 90% CO removal because of innovative Emission Control System.
Source: Pactex, 1983b; SCAQMD, 1984b; ES, 1985.

annual fuel consumption are shown in Appendix A. Emissions were based on emission factors shown in Appendix A. Emissions were calculated by multiplying the emissions per visit by the number of visits for each tanker class per year.

Total emissions within the SCAQMD source receptor area 4 (SCAQMD, 1983) compared with worst case 24-hour operating scenario emissions due to the Pactex project are given in Table 4.2.1-14.

Table 4.2.1-13 - Summary of Emissions for Annual Average Operating Scenario

Emission Source	Emissions (lb/day) ROG	NO_x	SO_2	CO	Part.
Propulsion	1	39	50	4	25
Operational					
Without air pollution controls	34	669	858	146	1,117
With air pollution controls[a]	3	67	86	15	335
Fugitive emissions	17	0	0	0	0
POLA storage tanks	192	0	0	0	0
POLA terminal fugitive emissions	17	0	0	0	0
Employee vehicular traffic	3	9	1	41	1
South Coast Air Basin Total (with air pollution controls)	233	115	137	60	361
Midland terminal storage tanks	218	0	0	0	0

[a]See footnote b, Table 4.2.1-12.
Source: Pactex, 1983b; ES, 1985.

Table 4.2.1-14 - Comparison of 24-hour Operational Emissions, Pactex Project with SCAQMD Source - Receptor Area 4 Emissions

Source	Emissions (tons/day) CO	NO_x	ROG	SO_2	Part.
Pactex Project	0.1	0.3	0.1	0.1	0.1
SCAQMD Area 4	414	116	105	NA	NA

NA = not available.
Source: SCAQMD, 1983.

As noted, the Pactex project would increase emissions by a negligible percentage (less than 0.3%) in the SCAQMD's source - receptor area 4.

2. Operational Impacts. The operation of the marine terminal and pipeline will result in increased pollutant emissions in the Los Angeles Basin and Midland, Texas. Operation of the Midland tank farm would not be expected to cause a violation of Federal/state air quality standards. The SCAQMD NSR regulations (see subsection 3.2.1.A.1) require that all emission increases relating to a project that requires NSR be offset by emission decreases elsewhere in the basin.

Pactex has agreed to completely offset emissions of ROG and other pollutants regulated under SCAQMD NSR rules at a ratio of at least 1.1:1. The net emissions decrease in the area should result in a net air quality improvement in the POLA area. Operational emissions are being evaluated by SCAQMD in conjunction with Pactex's permit application.

The SCAQMD has determined that emissions from the POLA facility and tank farm are subject to the 1.1:1 offset requirement. If the innovative technology exemption is granted for the tanker flue gas scrubbing system, then no offsets would be required for vessel emissions (SCAQMD, 1984b). However, offsets would be required for the POLA tank farm. This offset requirement would be approximately 230 lb/day of ROG.

E. Summary

Construction and operation of the Pactex pipeline would result in some degradation of air quality, especially during the construction phase. These impacts would be short term in nature and would not by themselves violate any air quality standard. Significant construction impacts would be mitigated through the use of properly tuned construction equipment, low sulfur/nitrogen fuel, and dust suppression techniques. Pactex has obtained ROG emission reductions to offset operational emissions at the POLA tank farm. The calculated tanker operational emissions for the Pactex project are considered to be worst case since a portion of the hoteling emissions already occur as a result of existing tanker refueling operations at POLA. Significant operating emissions from the tanker flue gas would be mitigated through the use of the ECS. This system incorporates innovative technology and could serve as a model for future marine loading operations. Because the growth that results from project implementation would be minimal (new jobs, industry, housing, etc.), the project is consistent with the SCAQMD-AQMP.

4.2.2 GEOLOGIC AND SEISMIC SETTING

A. Physiography and Topography

1. POLA Area. Both subaqueous and terrestrial physiographic and topographic impacts would occur as a result of project development in the POLA area. Modifications to the shoreline environment would be nonconsequential in that natural physiographic and topographic features no longer exist in San Pedro Bay. Compacted fill has long since occupied areas that were previously marshland and nearshore environments (as can be seen in Figure 3.2.2-6).

This proposed project would continue the established trend of reclaiming land in San Pedro Bay by creating a 115-acre landfill island located about 2,800 ft offshore. The approximately 15 million yd^3 of fill necessary to create the offshore island would be utilized from the materials excavated during the proposed channel deepening. The elevation of the island would rise 17 to 20 ft above the mean lower low water (MLLW) level. Other than the offshore island and associated excavations, no significant abovewater impacts on the POLA area physiography and topography are expected.

Subaqueous impacts on the current physiography and topography of the bay floor would occur as a result of construction of the proposed channel, turning basin, and trench for the pipeline installation. Channels would be dredged from their present 30 ft to 40 ft below MLLW to a depth of 75 ft below MLLW. Trenching for the installation of the pipeline from the offshore island to the shore would also have an impact on the bottom topography during the construction phase. More detailed descriptions of the proposed island facilities are contained in Section 2.

2. POLA to Blythe. Physiographic and topographic impacts resulting from the development of the pipeline would be associated with the excavation necessary for the construction of the pipeline. Trench excavation and backfill would modify the existing landform in the short-term construction phase and could leave permanent scars in the terrain in areas where the pipeline route traverses bedrock. The pipeline generally avoids rock formations that necessitate using explosives to excavate the trench by routing it through areas of unconsolidated sediments. The most significant exception to this is where a 2- to 3-mile length of bedrock is crossed in the vicinity of the Jurupa Mountains near Riverside, California.

Minor but permanent changes in landforms along the pipeline route resulting from trench excavation, access road construction, and grading would occur. Impacts of these construction activities are principally visual changes of the landforms. Alterations of existing drainage features may also cause minor but permanent changes.

Current pipeline design calls for trenching across three major water courses, the San Gabriel, the Santa Ana, and the Colorado Rivers, and numerous minor water courses. Short-term impacts on the topography (by trenching) would occur where construction activities cross river channels. Excavation depths of the trenches would be designed to account for maximum potential scour depths. The trenches would remain open for the days to weeks it would take to

complete the excavation and laying of the pipeline. The existing channel would be modified by the changes and probably have short-term impacts such as increased stream bank erosion and increased sedimentation downstream. With completion of the pipeline crossing, the streambed would eventually reestablish itself.

3. Blythe to Midland. As discussed in subsection 3.2.2, the pipeline route would generally traverse lowland areas with relatively subdued topography, but there are several hilly or mountainous areas that cannot be avoided. These areas include the Dome Rock Mountains in western Arizona; the Santa Catalina, Galipur, and Dos Cabezas Mountains in eastern Arizona; and the Hueco and Delaware Mountains in Texas. Impacts on the existing topography are expected to be minor. Some blading, contouring, and cut and fill would be required, but the route would follow existing corridors and mountain passes as much as possible, keeping changes to a minimum. These changes would be associated primarily with the construction period. The contours would be restored as close as possible to their original condition. Temporary impacts would occur as a result of trenching at river crossings including the Gila, Rio Grande, and Pecos Rivers. However, once the pipeline was installed, the trenches would be backfilled and the stream channels would be restored as close as possible to their original condition. The streambed would eventually (during normal flood flows) conform to the surrounding conditions. No significant impacts on the topography would thus be expected.

B. Geology

Principal geologic impacts evaluated for the POLA, POLA-to-Blythe, and Blythe-to-Midland sections are slope instability, subsidence and differential settlement, and effects on mineral resources. Potential offshore sediments, volcanism, and flooding impacts are also noted where applicable. Fault and seismic hazards are evaluated in a separate, following section. The map index (Appendix J) depicts the geologic hazards associated with various sections of the pipeline.

1. POLA Area.

a. Offshore Sediments. Impacts resulting from dredging associated with the proposed channel deepening and construction of the proposed island would depend on the physical and chemical character of the dredged material, the type of dredging operation, and the physical and chemical character of the newly exposed strata. Well logs along the route of the proposed channel deepening (COE, 1977, 1978) indicate the dredged material would consist mainly of sandy silt. The subaqueous excavation may expose some organic strata but should have no significant effect on the local geology of the offshore environment; a minor byproduct of the dredging would be increased turbidity and suspended sediment in the waters followed by redeposition. The construction of the offshore island would affect water current circulation locally and increase turbidity. Changes in harbor topography could cause minor changes in sedimentation patterns.

b. Slope Instability. No significant slope stability impacts in the subaqueous environment are expected. A minor potential for slope failure is

associated with the two unbuttressed sides of the proposed offshore islands. These slopes would be gentle (10:1) but could potentially fail if triggered by a seismic event. Erosion and sedimentation impacts on the 10:1 sloped western and southern slopes of the proposed island could have adverse impacts of increased turbidity and possible slope instability. According to POLA development plans as discussed in subsection 4.6 and shown in Figure 2.2.1-1, the proposed Pactex island would be extended by future POLA development adjacent to and directly abutting the two 10:1 sloped sides. These two gently sloping sides are thus designed for near-term development extending beyond them and not for long-term stability. The duration of exposure of the 10:1 slopes to potential erosion and sedimentation resulting from a lack of a rock dike slope protection measure would determine the degree of impact. In the event that the POLA development does not proceed in a timely manner, to prevent short-term erosion, a number of proprietary temporary slope protection systems are available for use by Pactex such as weighted plastic sheets, sand bags, and nets. Such a system could be laid on the slope through the range of tidal and wave activity to temporarily stabilize the 10:1 slope until the POLA diking/landfill is sufficiently complete to protect the temporary slope. At this point in time, the system would be removed from the marine environment. The potential for slope failure would be a very significant hazard if the landfill island were not expanded and/or diked as proposed in the 2020 Plan (COE, 1984a). In addition, failure of the 3:1 slopes proposed along the margins of the subaqueous channels is possible in the event of fault rupture along the Palos Verdes trace. Landsliding potential in the shoreline area of the POLA is negligible because of its nearly level ground surface.

c. Subsidence. Subsidence, the sinking of the ground surface, has occurred in the Los Angeles Harbor area as a result of extraction of oil from well fields between 1928 and 1965, but this subsidence has recently been reported as nearly arrested (Allen, 1981) because of a program of reinjection of water into the depressed zones that began in 1959. The potential for structural damage to the pipeline from subsidence caused by discontinuation of the reinjection process is remote because this process is an integral part of the oil extraction operations (secondary and tertiary recovery).

Another cause of potential subsidence is consolidation of newly made ground created by deposition of dredged materials such as those proposed for the landfill island. This type of subsidence is generally short term in nature. Significant consolidation is expected to occur soon after deposition of the dredged materials and prior to construction.

d. Mineral and Petroleum Resources. No adverse impact to the existing oil and gas operations would be expected from construction of the proposed landfill island. No oil or gas deposit would be precluded from future development. The use of approximately 2.9 million tons of quarry rock for island dike construction would be a significant commitment of resources. This rock would probably come from quarries on Santa Catalina Island.

2. POLA to Blythe. Geohazards associated with project development are shown on the map index (Appendix J) for the POLA-to-Blythe section. Table 4.2.2-1 identifies the relevant map code, location, and geologic hazard associated with the particular area. The following subsections discuss the potential impacts along the pipeline alignment.

Table 4.2.2-1 - POLA to Blythe: Major Geologic Hazards Along the Proposed Route

Map Code[a]	Location	Geologic Hazard
G1	Port of Los Angeles and route from POLA to the Puente Hills (approximately 30 miles)	Liquefaction potential offshore tsunami and subaqueous landslide potential
G2	Puente Hills near Hacienda Heights	Landslide/rockfall
G3	Chino	Fault rupture/ground deformation potential
G4	Colton, San Bernardino, Loma Linda	Fault rupture/ground deformation potential
G5	Colton, San Bernardino (approximately 10 miles)	Liquefaction/ground deformation potential
G6	Indio	Fault rupture/ground deformation potential
G7	Palo Verde Valley beginning approximately 8 miles west of Blythe and continuing through the Colorado River floodplain (approximately 10 miles)	Liquefaction

[a]See Appendix J.
Source: BLM, 1976, Attachment 1, pp. 13-17; ES, 1985.

a. Slope Instability. Slope instability could cause damage and rupture to the pipeline and associated facilities. The principal types of slope instability are debris flows, landslides, and rockfalls.

Debris flows could have a potentially damaging impact on the pipeline during the lifetime of the pipeline. Debris flows are commonly limited to desert environments. The area most susceptible to debris flows along the pipeline route from POLA to Blythe is between Beaumont and Blythe. Debris flows occur unpredictably, being caused by summer thunderstorms or other intense precipitation periods. Effects of debris flows would be restricted to drainage channels and could result in damage to pipe supports or would bend, puncture, or rupture the pipe.

Landslides that may pose a threat to the integrity of the pipeline have been identified in the Puente Hills of southern California (BLM, 1976, p. 3-22).

Construction activities for the pipeline alignment through the Puente Hills are judged to have a low probability of inducing landslides, for instance, if excavations were made into existing landslides or landslide-prone materials, or if the natural equilibrium would be otherwise disrupted. Effects of landslides on the pipeline would depend on the location of the pipe with respect to the slide and could include bending, removal of support, or rupture. Rupture of the pipe would result in oil spills and would directly affect vegetation and water quality. Damage to the system would require maintenance or repair operations.

In addition to reactivating existing slides, new natural landsliding may occur in similar geologic units on slopes subjected to destabilizing conditions. This would include enlargement of existing slides, as well as separate new slides. The main factors that could lead to new natural instability would be undercutting slopes by erosion, excessive rainfall, and seismic shaking, acting either separately or together. The risk of these types of failures is judged low for enlargement of existing slides and for completely new natural slides within California (see Appendix J).

b. Subsidence and Differential Settlement. Subsidence could have adverse impacts on the pipeline by compromising structure supports by settling unevenly. As fluid, such as groundwater, is removed, a subsidence bowl would develop around the well field creating tensile stresses around the periphery of the subsidence bowl, resulting in vertical offsets and associated ground fissures. Ground fissures could enlarge to cracks hundreds of feet wide and attain a depth of 100 ft or more.

Although fissures and ground surface offsets of this type might expose short sections of the pipeline, the strength of the steel pipe should be sufficient to prevent rupture until the problem could be corrected during routine maintenance. For example, a 12-in. gas pipe crossing a 0.7-ft-deep offset fissure near Picacho Peak, Arizona, was excavated for inspection. No signs of damage or stress were found on the pipe; however, a 30-in. pipe filled with heavier crude oil might not fare as well. Rigid foundations of pump stations, valves, and other appurtenant facilities may be seriously affected by cracking or tilting if they are sited in areas experiencing ground settlement or fissuring.

Areas along the POLA-to-Blythe pipeline alignment where subsidence and differential settlement resulting from groundwater withdrawal is known to be occurring include the alluvial basin south of Chino (Wentworth et al., 1970).

c. Mineral/Petroleum Resources. No significant adverse impacts to mineral or petroleum resources would occur in the POLA-to-Blythe portion of the pipeline route. The amount of sand and gravel that might be excluded from possible future exploitation from the river crossings is insignificant compared to the total resource available. The pipeline would have no significant impact on oil or gas extraction in the operating fields traversed.

The route would not traverse properties of Proposed Mineral Producers or Highly Probable Production Areas identified by the BLM (1982). There is some possibility that future mineral development utilizing surface mining techniques or geothermal development could encroach on the pipeline ROW. If necessary, rerouting or redesign of a portion of the pipeline could be implemented to provide access to federally controlled mineral resources.

3. Blythe to Midland. The construction of the proposed pipeline from Blythe to Midland would result in trenching and other excavations relating to construction of the pump stations and access roads. No significant impacts to geologic units would occur as a result of this disturbance. Other impacts to the pipeline resulting from geologic hazards or preclusion of mineral resource development are described below. The geologic hazards along the Blythe-to-Midland pipeline alignment are shown in Table 4.2.2-2 and Appendix J.

a. Slope Stability. The risk of serious damage to the pipeline or ancillary facilities from slope instability from Blythe to Midland is judged negligible. The depth of burial of the pipeline in mountainous areas would prevent significant damage in the unlikely event of moderate to large rockfalls from the slopes above the alignment.

Rockfalls could occur in the Dome Rock Mountains and Peloncillo Mountains, Arizona, and the Delaware Mountains, Texas, where construction and maintenance activities associated with the pipeline might disrupt rock outcrops loosened by blasting vibrations or other construction or maintenance activities. Earthquakes are also a possible cause for ground vibrations in the Dome Rock Mountains area.

b. Subsidence. Subsidence caused by fluid withdrawal (groundwater) is occurring along the proposed route at several locations in Arizona. Surface effects include subtle changes in grade over relatively long distances and scarps and fissures in more localized areas. Vertical offsets up to several feet high and fissures up to several feet wide and 100 ft or more deep have been reported (BLM, 1976, p. 3-24). Areas of subsidence along this segment of the route include the Picacho area between Casa Grande and Coolidge, the Sulfur Springs Valley, and an area near Bowie, Arizona. Subsidence could result in damage to the pipeline, but regular inspection is expected to reduce this potential to a minimum.

Table 4.2.2-2 - Blythe to Midland: Geologic Hazards Along the Proposed Route

Map Code[a]	Location	Geologic Hazard
Blythe to Pine Springs		
G8	Gila River floodplain and channel	Liquefaction/lurching
G9	Coolidge area, from Randolph for approximately 14 miles southeast	Subsidence
G10	San Pedro River floodplain and channel	Liquefaction/lurching
G11	Sulphur Springs Valley approximately 6 miles northwest of Willcox (approximately 6 miles)	Subsidence
G12	San Simon Valley about 4 miles southeast of Bowie (approximately 8 miles)	Subsidence
G13	Rio Grande floodplain and channel (approximately 8 miles)	Liquefaction/lurching
G14	Delaware Mountains	Landslides/rockfalls
Pine Springs to Midland		
G15	Delaware Basin for approximately 20 miles to the west of the Pecos River	Solution collapse
G16	Pecos River floodplain and channel	Liquefaction/lurching

[a]See Appendix J.
Source: BLM, 1976, Attachment 1, pp. 17-24; 1984a.

c. Karstic Terrain. An area in west Texas and southeast New Mexico (the Delaware basin west of the Pecos River) delineated in Appendix J is locally characterized by the presence of sinkholes. These are surface depressions formed by solution and collapse of underlying soluble rock. These features may subside gradually over hundreds to thousands of years, or abruptly when the underlying solution cavern reaches a critical size. In the latter case, scarps from inches to many feet high can form over a short period of time.

Possible damage from karstic collapse is generally similar to that associated with subsidence. As for subsidence, the most effective strategies are avoidance of known or suspected sinkholes and frequent surveillance for signs of incipient failure. Frequent inspection of the route (see subsection 2.2.7.C) is expected to result in low probability or pipeline rupture.

d. Volcanism. The risk of damage to the pipeline leading to oil spillage from volcanism is judged negligible along the Blythe-to-Midland route (Mullineaux, 1976).

e. Unique Geologic Features. No impact to unique geologic features is anticipated.

f. Mineral/Petroleum Resources. The only potentially significant impact on mineral resources would involve major spillage of oil into open sand and gravel pits and quarries adjacent to the alignment [see discussion for the SOHIO Project (BLM, 1976, p. 3-20)]. The likelihood of such an occurrence appears very remote as discussed in subsection 4.2.16.

No other significant adverse impacts to mineral or petroleum resources would occur in this portion of the route. The volume of sand and gravel that might be excluded from possible future extraction at major river crossings is insignificant in comparison to the total resources in immediately adjacent areas. The same is true of undeveloped sulfur and potash salt deposits in Texas. The pipeline would have no significant impact on oil and gas extraction in the operating fields traversed, for example, in the high density area of western Texas.

C. Fault and Seismic Hazards

Four distinct but interrelated seismic phenomena constitute potential impacts to the proposed pipeline. In the order of generally decreasing potential of damage and/or rupture of the pipeline, they are:

(1) Ground shaking
(2) Ground failure
(3) Ground displacement along fault traces
(4) Water inundation by earthquake-generated waves

Depending on the topographic, geographic, and geologic features of a specific area, however, this general order of hazard potential may differ from the above. For example, in an area of unstable bedrock located entirely in steep mountainous terrain in an active fault zone, the potential hazard resulting from ground failure and ground displacement along faults may be greater than that caused by ground shaking.

Liquefaction, the earthquake-induced transformation of a stable granular material, such as sand, into a fluidlike state, similar to quicksand, is an example of a specific type of ground shaking hazard. Other earthquake-induced ground shaking hazards include lurching, differential settlement, and lateral spreading (see subsection 3.2.2.C.1.e). These are also ground failures. During a given earthquake, the intensity of ground shaking at a particular location point will depend on a number of partly interrelated variables. These include:

(1) Earthquake magnitude.

(2) Shortest surface distance from the causative fault.

(3) Depth of earthquake focus.

(4) Several factors collectively referred to as source mechanism.

(5) Local geologic conditions, including type and thickness of soils, surficial, and bedrock geologic units.

(6) General topographic and geologic structural framework of the region.

The potential hazards of the various faults along the pipeline route are shown in Tables 4.2.2-1 and 4.2.2-2. Earthquakes of higher Richter magnitude generally produce ground motions of longer duration and higher acceleration and amplitude. Large maximum accelerations have been recorded very close to the epicenter of some moderate earthquakes, such as Parkfield, 1966 (M = 5.6, maximum acceleration = 50% gravity, Housner, 1970); Stone Canyon, 1972 (M = 4.6, maximum acceleration = 70% gravity, Bufe and Tocher, 1974), and San Fernando, 1971 (M = 6.6, maximum acceleration = 125% gravity, Trifunac and Hudson, 1971). Engineers use these quantitative data in the design of earthquake-resistant structures such as pipelines.

1. POLA Area. The various categories of seismically induced hazards associated with the pipeline project in the POLA area are discussed below.

a. Liquefaction Potential. Liquefaction potential would likely be the most adverse potential seismically induced impact in the POLA area. This is the result of the presence of loose to medium dense saturated sands that compose most of the POLA area's artificial shoreline. The potential for liquefaction damage for the proposed landfill island is particularly high.

Recorded liquefaction in the southern portion of Long Beach area (Seal Beach), where local ground deformation occurred during the 1933 Long Beach earthquake, has been discussed in Section 3. Liquefaction in the POLA area could be triggered by a major earthquake event ($M \geq 5.0$) along the offshore Palos Verdes fault or other faults in the region. The Palos Verdes fault has been mapped as striking north by northwest, west of and parallel to the western side of the proposed island.

Youd and Perkins (1978) have subdivided liquefaction-induced ground failure potential into two constituents: opportunity for ground failure and susceptibility to ground failure.

The opportunity for ground failure is a function of the size and frequency of earthquakes in the surrounding region. The susceptibility to ground failure is a function of the nature of the geological materials and the relative likelihood that these materials would undergo liquefaction and ground failure during a sufficient level of seismic shaking (Youd and Perkins, 1978).

Ground failure opportunity can be estimated from Figure 4.2.2-1, which shows the maximum distance from a seismic source at which ground failure could occur during an event of a given magnitude. The area of the graph to the left of and above the bounding curve represents the area where opportunity for ground failure exists. Based on Figure 4.2.2-1, it can be inferred that the opportunity for ground failure exists at the site, as summarized in Table 4.2.2-3.

Liquefaction susceptibility can be estimated using the information presented in Table 3.2.2-3, which describes the nature of the geologic materials at the site. The materials in the POLA area consist of approximately 25 ft to 35 ft of generally sandy dredge soil overlying approximately 10 ft of soft natural sediments, which in turn overlie firm natural soils. The susceptibility of these materials when saturated will vary depending primarily on the degree to which they are compacted, with uncompacted materials having a very high susceptibility and compacted materials a low susceptibility.

The potential for liquefaction of the proposed landfill island exists, particularly if the fill is relatively uncompacted and continually saturated. Details of the liquefaction potential will be determined after a detailed classification has been made of the onsite soil materials and a finalization has been determined of the landfill island design (see mitigation measures, subsection 4.7).

b. Fault Displacement. The potential for fault rupture impacts in the immediate harbor area is limited to rupture occurring along the Palos Verdes fault zone. Characteristics of the offshore segment of this fault in the harbor area, discussed in Section 3, suggest that surface rupture along this fault trace is possible and that fault creep is occurring at a rate of about 0.01 in. per year (Darrow and Fisher, 1983).

Fault rupture along the fault trace closest to the proposed landfill island (about 1,000 ft west of it) would not directly affect the landfill island stability in terms of rupturing through the fill itself. However, a secondary effect of fault displacement of this fault could be the displacement of water that would cause wave inundation of the island. Direct impacts of ground displacement on the project would be limited to possible subaqueous slope failure of the 3:1 slopes proposed at the boundaries of the channels and turning basin, as these are within the fault zone.

Dames & Moore (1982) recently evaluated the earthquake recurrence and probability of surface rupture along the Palos Verdes fault based on long-term slip rates along the fault for a nearby facility in Los Angeles Harbor. Results of this investigation indicated a 10% to 20% probability of about 2 in. to 4 in. of displacement and 2% to 5% probability of 8 in. to 16 in. of displacement in a 50-year facilities lifetime. These estimates were for the entire (40-mile) length of the fault and would be significantly smaller for a particular point along the fault.

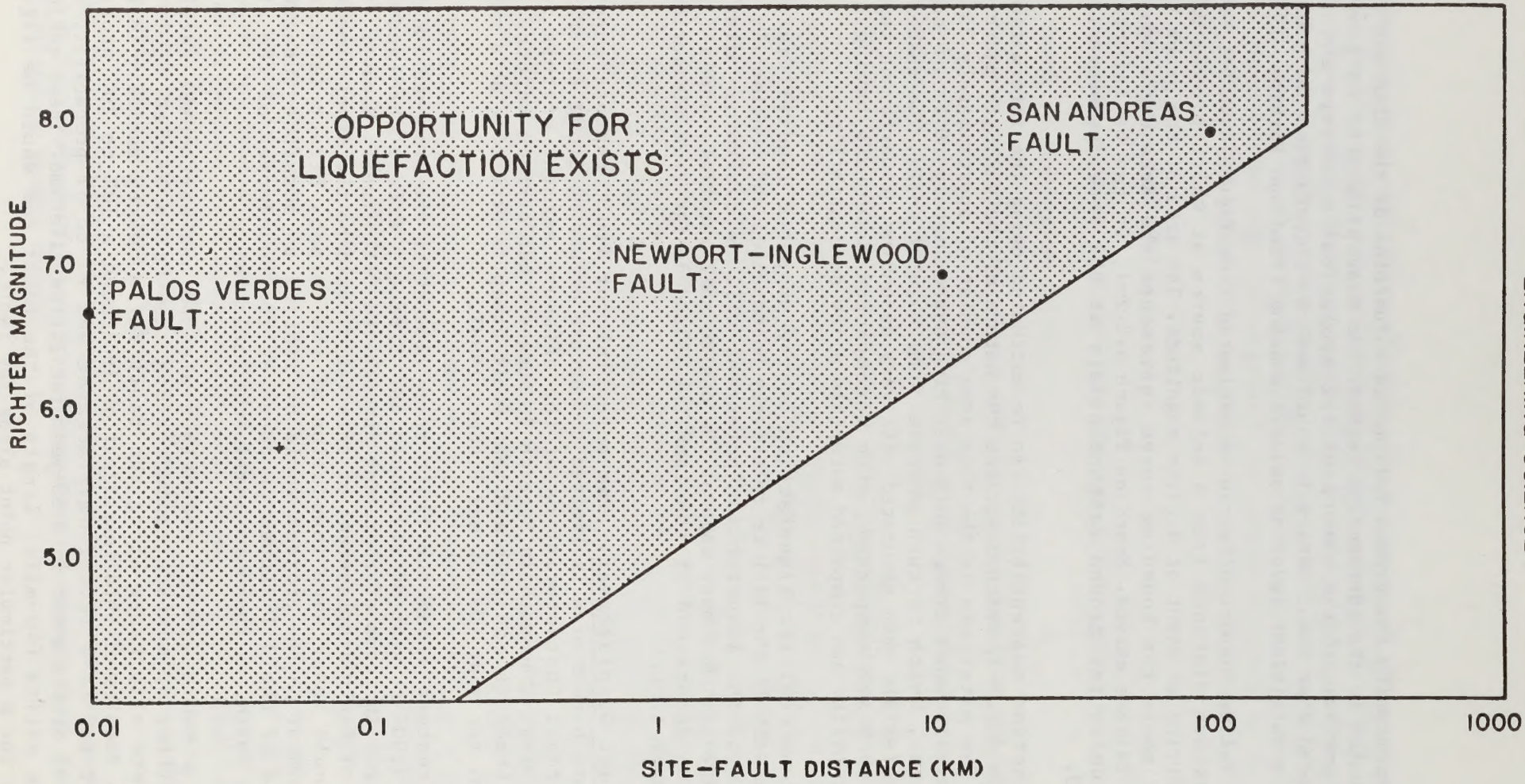


Figure 4.2.2-1 - POLA Area: Ground Failure Potential
(Youd and Perkins,1978)

Table 4.2.2-3 - POLA: Opportunity for Ground Failure

Fault	Estimated Maximum Magnitude	Distance to Fault (miles)	Maximum Distance to Liquefaction-Induced Ground Failure (miles)	Opportunity for Liquefaction-Induced Ground Failure at Site
San Andreas	8+	55	125	Yes
Newport-Inglewood	7	6	15	Yes
Palos Verdes	6.75	0	6	Yes

Source: Youd and Perkins, 1978; ES, 1985.

There are no other recorded faults that would pose a displacement hazard to the pipeline in the POLA area.

c. Tsunami and Seiche Impacts. Considering the records of historic occurrences, tsunami and seiche activity could adversely impact the proposed offshore island by causing increased erosion of the westward facing 10:1 slope. A tsunami could also be triggered by a sudden slip along the Palos Verdes fault offshore if a large watermass was displaced by the fault rupture. It is unlikely, however, that a tsunami of sufficient size to damage tank farm facilities would occur.

2. POLA to Blythe. With the exception of oceanographic effects such as tsunami and seiche activity, this segment of the route would experience similar fault and seismic hazards as those for the POLA area. Additional faults would be encountered and the proximity to other faults would vary along the route. The seismically induced hazards between POLA and Blythe are discussed below.

a. Liquefaction Potential. As discussed above for the POLA, liquefaction is a potential hazard to the pipeline that may be triggered by major earthquakes from several faults in the region. These faults include the Palos Verdes and Newport-Inglewood zones, the Whittier fault zone, and the San Jacinto and San Andreas fault zones. The areas where liquefaction could occur are associated with river channels or valleys where saturated soils occur close to the surface. An earthquake capable of causing liquefaction-induced damage to the pipeline along the route from POLA to Blythe would probably also cause severe damage to the terminal facilities at the POLA because somewhat larger magnitude events would be required to induce ground failure along the pipeline route because of the reduced structural load.

The pipeline route flanks the Los Angeles River and the Rio Hondo. Because of the normally saturated sandy soils along these water courses, the potential for liquefaction is moderate to high, with the highest potential occurring close to the POLA. Liquefaction could also occur across a broad stretch of the Santa Ana River and surrounding area where the river maintains a high water table saturating the sandy uncompacted soils. The Palos Verdes Valley and Colorado River floodplain near Blythe are also subject to liquefaction. Liquefaction would depend on the specific local soil conditions, but the water table is generally very close to the surface as a result of both natural infiltration from the Colorado River and additional input from the intensive irrigation in Palos Verdes Valley.

b. Fault Displacement. Several faults present a displacement hazard to the pipeline from the POLA to Blythe. After leaving the POLA, the pipeline would cross Cherry Hill fault, a branch of the Newport-Inglewood zone, with minor potential for surface rupture. Other faults such as the Chino fault and other traces of the Whittier-Elsinore zone pose a minor danger of fault displacement damage to the pipeline.

The faults with high potential for displacement are the San Jacinto and San Andreas fault zones (Clark et al., 1984). The pipeline would cross the San Jacinto and several of its branches in the vicinity of San Bernardino. The San Andreas fault zone would be crossed near Indio. The San Andreas fault zone in this area is reported to have about a 40% chance of a major earthquake occurring within 30 years (Ziony, 1985; Ellsworth, 1985). Although the exact location of future displacement along these two faults cannot be predicted, the potential for displacement-induced damage to the pipeline during the project life is high. Pipeline damage has been reported as being four times greater within 60 ft of an active fault-trace centerline (O'Rourke et al., 1982). Block and check valves would be used to minimize the quantity of oil that could be spilled at these fault crossings. Other specific design features that are potential mitigation measures are discussed in subsection 4.5. Fault creep from these two faults could also damage the pipeline by bending; however, the damaging effects would be less than that caused by fault displacement (O'Rourke and Trautman, 1981; O'Rourke et al., 1982).

3. Blythe to Midland. As discussed in subsection 3.2.2.C.3, the historic seismicity of this segment of the route is very limited and no recent or late Quaternary faults would be crossed (BLM, 1984a, p. 3-18). Estimates by Algermissen et al. (1982) show a maximum peak rock acceleration for a 500-year return period to be 0.1 g to 0.15 g located along the route in southeastern Arizona. Thus, there is a relatively low risk of serious damage to the pipeline or pump stations from seismic effects in the Blythe-to-Midland area. Secondary effects of strong ground motion including slope instability and liquefaction are possible. (These effects are described in more detail in the POLA and POLA-to-Blythe segments.) These areas are identified in Table 4.2.2-2 and Appendix J. Given the regional setting in which the pipeline occurs, the likelihood of these factors resulting in damage to the pipeline is considered low to moderate. The area of western Arizona would be the most susceptible to strong ground motion because of its proximity to the San Andreas fault zone.

D. Summary

The construction of the proposed landfill island would be a long-term alteration of the local physiography in Los Angeles Harbor. A substantial quantity of rock (2.9 million tons) would also be required for the landfill island dike construction.

The proposed landfill island terminal facilities and pipeline would be exposed to significant geologic hazards. The most serious geologic hazards are those associated with faulting and seismicity in the POLA area and between the POLA and Blythe. The landfill island would be subject to liquefaction and slope failure resulting from earthquakes along several of the faults in the region. A major earthquake along the offshore segment of the Palos Verdes fault could cause a tsunami of sufficient magnitude to damage terminal facilities. The pipeline would cross the San Jacinto and San Andreas fault zones creating significant risks of ground rupture, pipeline damage, and oil spills. Other geologic hazards along the pipeline route include areas of slope instability and subsidence including the karstic terrain of western Texas and southeastern New Mexico.

4.2.3 SOILS

The impacts to soils are discussed in relation to the terrestrial pipeline route. The relationship of soils to marine water quality and to liquefaction potential of the proposed landfill island is discussed in subsections 4.2.15 and 4.2.2, respectively.

Impacts to soils could occur during construction and pipeline operation. Impacts would be considered significant if increased erosion rates or reduction of soil productivity resulting from project activities would prevent successful rehabilitation and eventual vegetation regeneration. Evaluations of successful rehabilitation are based on whether soils having severe rehabilitation constraints would stabilize with respect to erosion from all causes to near preconstruction conditions within approximately 1 year following application of the proposed plans and compliance with Federal stipulations for erosion control and revegetation.

A. Construction

Specific impacts during or as a result of construction will vary depending on the land use and specific stipulations mandated by land owners or land managers. The common types of rehabilitation techniques used for site restoration are discussed in the project description, subsection 2.2.4. A construction and use (CU) plan will be developed to address site-specific construction and rehabilitation requirements. This CU plan will result in most soils impacts being not significant. However, impacts resulting from construction activity would include:

(1) Accelerated soil erosion and deposition from wind and/or water action.

(2) Decreased productivity from compaction and horizon mixing.

(3) Increased soil slumping potential.

Locations along the proposed route where soils-related impacts are possible are shown on the index maps (Appendix J).

Accelerated soil erosion in the form of sheet, rills, and gullies could result from the removal of vegetative cover, especially on moderately steep to steep slopes occurring along major portions of the route. Compaction by heavy equipment would reduce the infiltration rate and water-holding capacity of the soils, increase runoff and erosion, and adversely affect revegetation success. Horizon mixing could create chemical (salinity) and physical (compaction, difficult seedbed preparation) problems, except in irrigated cropland areas where soils would be segregated. Horizon mixing could redistribute subsurface salts into the surface layers, adversely affecting productivity. Disturbances to steep, clayey soils predispose these areas to soil slumping, which results in increased erosion, revegetation problems, and pipeline instability. In general, revegetation through these desert regions would be particularly difficult because of the limited annual rainfall. However, certain segments of the route (particularly eastern Arizona and New

Mexico) may have enough annual rainfall to permit revegetation. Other erosion control measures will be stipulated by Federal agencies for lands managed by the BLM and the Forest Service (BLM, 1985).

Soil contamination from oil or gasoline loss from construction equipment is possible but is expected to be limited and minor with normal precautions.

B. Operation

Significant adverse impacts to soils would result from oil pipeline leaks and ruptures. Contamination of soils would result in increased microbial activity and decreased water uptake and infiltration rates (Rowell, 1975). Oil spills may adversely affect soil structure and consequently render the soils more susceptible to erosion (Ellis and Adams, 1961). Soil productivity would be reduced within a spill area and result in a temporary decrease in vegetation production levels. The size and duration of soil impacts caused by oil spills would be dictated by the extent of the spill, infiltration depth of the oil, soil characteristics, local topography, and type of vegetative cover.

Impacts from oil spills would be small in magnitude because of the limited ability of spilled oil to disperse over large areas of land. An oil spill of 15,000 barrels would likely contaminate less than 16 acres of land, based on MacKay and Mohtadi's 1975 study of 53 oil spills in Alberta, Canada, in which estimates were based on shallow soils (8 in. deep). Because most of the soils along the pipeline route are deeper than 8 in., the maximum area disturbed by an oil spill would probably be less than 16 acres but could be greater in extremely shallow soils on steep slopes. This is a very large spill however, and is judged to have a very low probability of occurrence (subsection 4.2.17).

Agricultural areas would be the most sensitive to oil spill impacts. The impacts in these areas would be soil contamination and subsequent loss of production. Depending on the depth of oil penetration and climatic conditions, reclamation of oil-damaged soils can take from 1 to many years following contamination (Rowell, 1975; Plice, 1948). Oil spill-related impacts to soils would be minimized to the extent possible. Because reclamation practices can be feasibly implemented in agricultural areas, reclamation of agricultural lands would most likely occur more quickly than in native plant communities.

C. POLA to Blythe

The construction of the proposed landfill island would include the dredging of soils from the outer harbor channel and their use as fill material. This process, which could result in a release of pollutants from contaminated soils into the marine environment, is discussed in subsection 4.2.15, Oceanography and Marine Biology. The dredge material used for island construction will also have potential for liquefaction because of the soil gradation and saturated condition. This relationship of the soils, seismic activity, and island design is discussed in subsection 4.2.2.

Protective vegetation would be removed from the route as a result of pipeline construction. This would leave exposed soils vulnerable to erosion. However, most of the route through Los Angeles County is heavily urbanized with previously disturbed areas because the route would parallel the Los Angeles and Rio Hondo Rivers, continuing below Whittier Narrows Dam. This part of the proposed route is susceptible to liquefaction as a result of the sandy soils and high water table. The characteristics of these sensitive soils and others from POLA to Blythe are shown in Table 4.2.3-1. The major problems associated with these soils are:

(1) Water erosion (e.g., Santa Ana and Whitewater Riversheds)
(2) Irrigated cropland (e.g., Palo Verde Valley)

The pipeline would cross a short segment of the Puente Hills in the Hacienda Heights area, creating the potential for landslides and rockfalls. The area along San Jose Creek through La Puente and Walnut experiences expansive soils; however, because of the burial depth of the pipeline, this should not cause significant impacts.

The pipeline would cross the Santa Ana River near Colton and pass through the San Timoteo Canyon area; both areas have soils highly susceptible to water erosion. This is the primary problem relating to soils for the remainder of the route to Blythe, including areas along the San Gorgonio and Whitewater Rivers and several other minor tributaries. The pipeline route would follow fairly subdued terrain so that it is unlikely that erosion would result in exposing the pipeline. Stream crossings would be made at least 4 ft below the 100-year scour depth. Occasional, limited areas of dune sands also occur along this segment of the route, creating potential for wind erosion during and after construction. However, site grading and depth of burial would result in negligible potential for pipeline exposure.

The Palo Verde Valley is an area of soils ranging from silty clays to clay loams. This, together with high water tables, creates potential for soil liquefaction. Impacts to the agricultural soils of this valley resulting from oil spills would be very significant. However, the potential for soil contamination in the Palo Verde Valley would be kept to a minimum by following the ROW of existing roads as much as possible.

Areas where the route must cross irrigated fields would use special construction techniques, including burial to depths with at least 10 ft of cover to prevent damage to the pipeline resulting from deep ripping or tilling. Impacts to agricultural operations would also be kept to a minimum by restoring irrigation systems to their original or better condition.

D. Blythe to Midland

Adverse impacts resulting from construction would be accelerated soil erosion and deposition and decreased productivity from compaction and horizon mixing. Although most of this route would cross level to gently sloping terrain, the steep slopes of isolated mountains (e.g., Winchester Mountains) would present accelerated water erosion problems as a result of construction activities. Construction would result in accelerated wind erosion especially in those

Table 4.2.3-1 - POLA to Blythe: Major Sensitive Soils and Asssociated Risks

Map Code[a]	Location	Sensitive Characteristics	Significant Risks	Representative Soil Series
S1	Puente Hills (Hacienda Heights)	Steep slopes	Landslides and rockfalls	Tujunga, Soboda
S2	San Jose Creek	Clay soils	Expansive soils	Cropley
S3	Santa Ana River	Subject to flooding	Water erosion	Riverwash
S4	San Timoteo Canyon	Subject to flooding	Water erosion	San Emigdio, Metz
S5	San Gorgonio/Whitewater Rivers	Subject to flooding, high winds	Water and wind erosion	Rositas, Carrizo
S6	Palo Verde Valley	Agriculture	Liquefaction and oil spills	Imperial, Holtville, Meloland

[a]See maps in Appendix J.
Source: ES, 1985.

soils with coarse-textured surface layers and in the saline/alkaline soils of fine textures (playas). Compaction and soil horizon mixing impacts from construction activities would decrease soil productivity, especially in agricultural areas (BLM, 1984a, pp. 4-26 to 4-30).

Sensitive soil units along the Blythe to Midland pipeline route are described in Table 4.2.3-2 and shown in Appendix J. These areas are considered sensitive based on the following characteristics, which are major potential problems associated with erosion control and revegetation:

(1) Steep slopes and shallow soils (e.g., Winchester Mountains)

(2) Irrigated cropland (e.g., Gila and Rio Grande Rivers)

(3) Flood-prone areas (e.g., Colorado, Gila, Pecos, and Rio Grande Rivers)

(4) Saline/alkaline areas (e.g., Animas Valley, Willcox Playa, and Salt Basin)

(5) Sand dunes and sandy soils (e.g., plains of eastern New Mexico and western Texas)

Significant short-term impacts of 1 to 2 years would result from an oil spill as discussed above. The major croplands of Rainbow Valley and Deming, and along the Gila and Rio Grande Rivers, would be the most sensitive to oil pipeline leaks and ruptures.

E. Summary

Impacts to soils would occur as a result of construction and operation of the proposed pipeline. These include accelerated soil erosion, decreased productivity from compaction and horizon mixing, and increased soil slumping potential. With the execution of sound mechanical erosion control and revegetation techniques, however, impacts on soil productivity from construction would not be significant. Significant soil impacts, including reduced soil productivity, increased soil susceptibility to erosion, and decreased water uptake and infiltration rates, would result if oil spills occur.

Table 4.2.3-2 - Blythe to Midland: Major Sensitive Soils and Associated Risks

Map Code[a]	Location	Sensitive Characteristics	Significant Risks	Representative Soil Series
Arizona				
S7	Colorado River	Subject to flooding	Water erosion and deposition, compaction	Gilman, Antho, Vint
S8	Eagletail Mountains	Steep slopes, depth to rock[b]	Water erosion and revegetation	Lomitas and Cherioni
S9	Harquahala Plain (Centennial Wash)	Subject to flooding, agricultural lands	Water erosion and deposition, compaction, horizon mixing	Gilman, Antho, Vint
S10	Gila River near Gillespie Dam	Subject to flooding, agricultural lands	Water erosion and deposition, compaction, horizon mixing	Gilman, Antho, Vint
S11	Between Randolph and Rainbow Valley	Subject to flooding, agricultural lands	Water erosion and deposition, compaction, horizon mixing	Gilman, Antho, Vint
S12	North of Tortolita Mountains and east of Picacho Mountains	Subject to flooding	Water erosion and deposition, compaction	Gilman, Antho, Vint
S13	Santa Catalina Mountains near Oracle	Moderately steep to steep slopes	Water erosion and revegetation	Caralampi, Latene, Nickel, House Mountain

Table 4.2.3-2 (Contd)

Map Code[a]	Location	Sensitive Characteristics	Significant Risks	Representative Soil Series
Arizona (Contd)				
S14	Winchester and Dos Cabazos Mountains	Steep slopes, depth to rock[b]	Water erosion and revegetation	Faraway, Luzena
S15	North of Willcox Dry Lakebed	Sodic/saline	Water and wind erosion, revegetation	Gothard, Crot
S16	East of San Simon	Steep slopes, depth to bedrock[b]	Water erosion and revegetation	House Mountain, Nickel
New Mexico				
S17	Animas Valley	Alkalinity	Revegetation	Hondale, Mimbres
S18	Deming area and north of Florida Mountains	Agricultural lands	Horizon mixing and compaction	Hondale, Mimbres
S19	East of Florida Mountains and west of Aden	Coarse-textured surface layer	Wind erosion	Pintura
S20	Dona Ana County between Aden and Chamberina	Coarse-textured surface layer	Wind erosion	Cacique, Pintura
S21	Rio Grande River	Subject to flooding irrigated cropland	Water erosion and deposition, compaction, horizon mixing	Gila, Vinton

Table 4.2.3-2 (Contd)

Map Code[a]	Location	Sensitive Characteristics	Significant Risks	Representative Soil Series
Texas				
S22	West of Hueco Mountains and east of Newman	Coarse-textured surface layer	Wind erosion	Hueco, Wink
S23	Salt Basin - west of Guadalupe Mountains	Alkalinity	Revegetation and flooding	Holloman, Reeves, Hoban
New Mexico				
S24	Pecos River	Subject to flooding	Water erosion and deposition, compaction	Gila

[a]See maps in Appendix J.
[b]Depth to rock less than 20 in.
Source: BLM, 1984a, p. 4-27 to 29; ES, 1985.

4.2.4 SURFACE WATER

Impacts to surface water would occur primarily during construction and potentially during pipeline operations. The considerations used to determine the significance of impacts to surface water are:

(1) The extent of water quality deterioration with respect to existing state and Federal standards.

(2) Changes to the quantity or quality of discharges from streams resulting from water withdrawals, in-stream construction, or accidental contamination.

(3) Changes in channel geometry or gradients sufficient to produce undesirable effects such as aggradation, degradation, or sidecutting.

(4) Construction of any permanent aboveground facilities within the 100-year floodplain (consistent with Executive Order 11988).

(5) The degree of sedimentation downstream of pipeline crossings sufficient to affect the operation of irrigation water control structures.

A. Construction Impacts

Short-term impacts from pipeline construction would be increased sediment yield from areas disturbed during construction and localized channel aggradation or degradation.

Construction earthwork near the stream channel would create the potential for soil erosion and the subsequent increase of sediment loads in the stream. A decrease in water quality would also be expected due to a major increase in sediment loads during pipeline construction. The increased turbidity would be temporary and would decrease to preconstruction levels within a short time (up to 2 weeks) after construction is completed. No significant long-term impact to stream water quality or irrigation water control structures would be expected.

Construction of pump stations or tank facilities within the 100-year floodplain is not planned. No significant impact to these structures is expected as a result of flooding.

Impacts to surface water resources caused by the discharge of hydrostatic test water would not be significant. The pipeline would be tested in successive sections along the route; however, it is not now known where the water will be purchased and/or discharged. During hydrostatic testing, the water would pick up construction debris, millscale, minimal hydrocarbons, and some mud. The water would be tested and treated, if necessary, before release in accordance with applicable regulations. The water would be released in a controlled manner so that natural waterways would not be degraded. Similar discharges from dewatering operations would be treated to conform to

acceptable effluent limitations. Suspended solids would be controlled by ponding or other acceptable means.

Changes in channel geometry resulting from in-stream construction are not expected to be significant. The construction would occur during periods of low flow, where feasible, and the channel bed would be returned as close to its original form by replacement of dredge material.

A permit issued by the COE will be required under Section 404 of the Clean Water Act for all stream crossings. This dredge-and-fill permit will mandate certain requirements for the protection of public water supplies and in-stream users such as endangered species. The permit will also define best management practices to be used during construction.

Other possible impacts to surface waters caused by construction activities would be spills of lubricating oils or equipment fuels. Impacts caused by spills of this nature would be of small areal extent but could be significant, particularly if the spill occurred in a small watercourse.

B. Operational Impacts

The most significant impact on surface water would result from crude oil spilled into a watercourse from a pipeline leak or rupture. Leakage and rupture are possible from pipeline corrosion and potential stream channel degradaton. A spill resulting from a small leak may involve as much as 500 barrels of oil before being detected. The amount of oil involved in a large spill would be equal to the volume in the pipeline between the break and the nearest block and check valves on either side (assuming a complete drainage before the arrival of repair crews). The amount of oil that would flow through the line until the safety equipment shut the pipeline down must also be included. Oil spill volume estimates for sensitive streams are discussed in subsection 4.2.17. Small streams would be temporarily overwhelmed by this quantity of oil, and larger streams would carry the oil many miles downstream.

The volumes of oil that could be released into inland surface waters are appreciable. The volumes shown in Table 4.2.4-1 are calculated for a 4-in. pipeline leak and for a major rupture (preceded by system shutdown) at the major river and stream crossings. For more information on the assumptions used to calculate these volumes, see subsection 4.2.17.

Water quality would be degraded by more volatile fractions of the oil going into solution. Depending on the flow regime at the time of the spill, oil could be incorporated into the sediment or the stream bottom so that some oil would be released after the spill was originally cleaned up (EPA, 1982b). The duration of the water quality impact would probably be only a few weeks after the oil was cleaned up, particularly on larger streams with a large enough flow to dilute the oil remaining after cleanup. Water polluted with crude oil would be unsuitable for domestic or irrigation use. Hydrocarbon pollutants could be released downstream of the spill for longer periods if significant sediment contamination were to occur.

Table 4.2.4-1 - Estimated Potential Oil Spill Volumes at Major River and Stream Crossings

Major Crossing	4-in. Leak[a]		Major Rupture[b]	
	bbl	gal	bbl	gal
Los Angeles River[c]	2,728	114,570	1,648	69,210
Santa Ana River[d]	81,133	3,407,305	80,053	3,361,945
San Timoteo Creek	1,575	66,123	495	20,763
San Gorgonio River[d]	49,808	2,091,761	48,728	2,046,401
Whitewater River[d]	44,587	1,872,504	43,507	1,827,144
Colorado River	3,387	142,254	2,307	96,894
Gila River	3,551	149,175	2,471	103,815
Wild Cat Canyon Creek	1,575	66,123	495	20,763
Bass Canyon Creek	1,575	66,123	495	20,763
San Pedro River	3,551	149,175	2,471	103,815
Rio Grande	2,398	100,728	1,318	55,368
Pecos River	6,024	252,990	4,944	207,630

[a]Volumes calculated for an operating pressure of 900 psig for 5 minutes (Table 4.2.17-1). Analysis includes initial 5-minute leak and assumes complete drainage between block and check valves.
[b]Volume based on distance between block and check valves (Table 4.2.17-11).
[c]Aboveground crossing.
[d]No block and check valves are currently planned for this river crossing.
Source: Pactex, 1985; ES, 1985.

The pipeline could potentially be affected by scour and natural changes in the stream channel's morphology over its operational life. Pipeline breaks would be possible during very large flow events; however, this potential would be limited by burying the pipeline below the 100-year scour depth with an additional 4.5 ft of cover. The pipe would also be encased in concrete to prevent buoyancy of the pipeline during flood events.

C. POLA to Blythe

As discussed in subsection 3.2.3, there are several streams and drainages that could be impacted by construction and operation of the proposed pipeline in southern California. Impacts to water quality in the marine environment are discussed in subsection 4.2.15. The Los Angeles River and its tributary, the Rio Hondo, would both be paralleled and crossed by the pipeline. Construction impacts to these drainages are expected to be negligible, however, because these are concrete channels in the proposed project locations. The Los Angeles River and the Rio Hondo channels would be crossed

as aboveground structures, thus resulting in negligible impacts to the stream channel and water quality. Any discharge from hydrostatic testing would be required to meet the discharge requirements of the California Regional Water Quality Control Board with possible pretreatment required.

The other stream channels (e.g., the Santa Ana and Whitewater Rivers) would be crossed by using trenching techniques. Construction impacts would be minor because the streams will be crossed, where feasible, during periods of low flow. The temporary increase in sediment loads will be short lived and will be controlled by sedimentation ponds or other means. Any discharge from construction dewatering would be required to meet the requirements given in Table 4.2.4-2.

The most significant impacts that potentially could occur during operation of the pipeline would occur from accidental spills. The most sensitive streams are the Santa Ana River (and San Timoteo Creek) and the Whitewater River. Oil spills could result from pipeline rupture adjacent to or within the stream channel. The oil spill detection system and the presence of block and check valves would help to limit the quantity of oil spilled. The Santa Ana and Whitewater Rivers, however, do not currently have block and check valves planned at these crossings. The actual quantity of oil spilled is dependent on the pressure in the system and the time between leak occurrence and system shutdown. The leak detection system and oil spill contingency plan are described in subsection 4.2.16 and Appendix G, respectively. The probability of oil spills over the life of the system are discussed in subsection 4.2.17. Any oil spill into the Santa Ana and Whitewater Rivers would be considered significant not only because of the impact to the surface water but because of the potential for transport to and contamination of underlying groundwater. These basins are heavily developed for municipal and irrigation uses. Although the most damage to stream water quality would be expected from a major leak or pipeline rupture, significant oil spills into receiving waters could occur from small leaks that are below the detection limit (subsection 4.2.17) of the leak detection system. Oil could thus be leaking into the water system for some time before detection by visual observation.

Table 4.2.4-2 - Expected Dewatering Wastewater Discharge Requirements[a]

Constituent	Concentration (mg/liter) 30-day Average	Maximum Daily
Total sulfides	0.2	0.4
Suspended solids	50.0	75.0
Chlorine residual	-	0.1
Oil and grease	None visible	None visible

[a]After CRWQCB, 1984b (NPDES representative permit).

D. Blythe to Midland

The major streams crossed by the pipeline would be the Colorado River at Blythe, the Gila River near the Gillespie Dam in Arizona, the San Pedro River near Redington in Arizona, the Rio Grande just north of the Texas border, and the Pecos River north of Red Bluff Reservoir.

Construction impacts would occur at the Colorado River. Although all streams would be crossed at times of low or no flow, the Colorado maintains a substantial flow throughout the year. Other streams that could be impacted by construction, depending on the stream flow at the time of crossing, are the Gila, San Pedro, Rio Grande, and Pecos Rivers. Increased turbidity would occur downstream of the Colorado River crossing as a result of trenching activities. Use of cofferdams at stream crossings instead of trenching would substantially reduce the sediment loads and turbidity impacts. Increased sediment loadings would also be expected from the large amount of disturbed area resulting from increased maneuvering and staging areas needed at the river crossing. Construction would require about 6 weeks (BLM, 1984a, p. 4-34), after which time suspended solids would decrease rapidly to preconstruction levels. Permanent change in the channel's morphology would be negligible, and effects of sediment would extend for only a short distance downstream. Any oil spill during the pipeline's operation would be very significant because of the very intensive use of Colorado River water for both municipal supply and irrigation.

Impacts to water quality during construction to the Rio Grande and Pecos Rivers would also be significant but somewhat less compared to the Colorado River. Increased turbidity would result from construction activity but due to the much lower flow (see Table 3.2.4-2) sediment loads would be reduced and travel shorter distances downstream. The Pecos River sediment loadings would be almost entirely dissipated by the Red Bluff Reservoir, located a few miles downstream. This additional loading to Red Bluff Reservoir would be considered negligible in comparison to the annual sediment load from the Pecos River. No municipal or industrial users are associated with this reservoir and therefore are not impacted.

E. Summary

Impacts to streams and rivers would occur during the construction period and potentially during pipeline operations. Oil spills resulting from a pipeline leak or major break would be limited by leak-detection systems and block and check valves on either side of each river crossing. Oil spill containment and cleanup equipment would be positioned at each maintenance station. In addition, the Colorado River would be further protected by oil spill containment booms, skimmers, and other equipment at the river crossing. Oil spills into surface waters would significantly impact water quality for the short term; impacts longer than 6 months to a year would not be likely because of the cleanup procedures.

Long-term impacts to surface water could occur if oil were to saturate stream sediments prior to cleanup if sediments were not removed. This oil would be released more slowly and would persist in the environment for many years.

4.2.5 GROUNDWATER

Considerations used in assessing the significance of impacts to groundwater resources are based on adverse effects to established water uses. These effects include changes in potentiometric heads or aquifer gradients sufficient to negatively affect well pumping characteristics. Other adverse impacts include the degradation of water quality by the introduction of oil or other pollutants.

Impacts to groundwater could occur during construction, operation, and abandonment of the proposed pipeline. Shallow water table aquifers are most susceptible to contamination. Deep aquifers are less likely to be affected because of the presence of relatively impermeable overlying layers in the case of confined aquifers or great thicknesses of unsaturated sediment overlying deep water table aquifers. No significant change in potentiometric heads or gradients is expected to occur.

Sensitive areas of groundwater basins were selected based on the depth to groundwater and the degree of groundwater use. These areas are described and identified on Tables 3.2.5-1 and 3.2.5-2 and the maps in Appendix J. The most important of the sensitive areas would be those aquifers used for public water supplies with very shallow depths to water and highly permeable soils and aquifer materials. These highly sensitive areas include the Upper Santa Ana Valley near San Bernardino and the Rio Grande Valley near El Paso. Significant impacts may occur outside of the identified sensitive areas but would affect aquifers of limited extent with relatively few groundwater users.

Groundwater impacts are expected to be limited to the groundwater regime in the vicinity of the pipeline and hydraulically down gradient within the affected aquifer. In the event of a spill into surface water, the oil could be carried downstream for a considerable distance before it would be contained; however, groundwater would not be substantially affected in downstream aquifers if spill containment is prompt because the oil would tend to float on top of the water surface because of its lower density. A recent major oil spill that occurred on the North Platte River demonstrates this conclusion (EPA, 1982b).

A. Construction Impacts

During excavation and burial of the pipeline, disruption of shallow aquifers may occur temporarily. Localized dewatering and increased turbidity impacts would be negligible. Effects would go unnoticed, except in very shallow wells immediately adjacent to the pipelines. Hydrostatic testing of the pipeline may introduce minor quantities of contaminants to aquifers in the event of leakage. These contaminants could include oil and grease, rust, metal fragments and welding slag, and bacteriacides added to the test water. Effects would be localized and short term because any detected leak would be located and repaired. Disposal of hydrostatic test water would include treatment (if necessary after conducting water quality tests) to meet NPDES permit stipulations and would be at an approved disposal location. Water from dewatering operations may require treatment through sedimentation ponds or other means to reduce turbidity to acceptable levels.

B. Operational Impacts

During operation of the pipeline, significant groundwater impacts would occur only in the case of a pipeline leak or rupture. The probabilities of a rupture occurring are very low (subsection 4.2.17).

Relatively small amounts of oil dissolved in water could cause taste and odor problems. Concentrations of 0.1 ppm could make water undesirable for drinking. Danger to human health from drinking oil-contaminated water is usually not a major problem because chronic toxicity concentrations are well above the levels of unpalatable taste and odor. However, long-term health problems could result from the exposure of large populations to very low concentration limits (i.e., below the taste and odor detection limits). Hydrocarbon-contaminated water would also cause adverse impacts where groundwater is used for irrigation, livestock, and industrial uses.

Leaks in the pipeline have higher probabilities of occurrence than major rupture, and smaller leaks (less than 3 bph) may go undetected by the leak detection system for days or weeks until the leak is detected by visual observation at the surface. For these reasons, smaller leaks pose a more probable threat of significant impact to groundwater than major spills or ruptures. Large spills, ruptures, or detectable leaks are less probable in terms of potential groundwater contamination because, in these instances, the pipeline valves would be closed immediately and the defect repaired. Because of the viscous nature of crude oil, nearly all of the spilled product could be cleaned up by removal of visibly contaminated soil near the surface. If cleanup efforts were prompt, very little oil would have an opportunity to seep to the water table.

Movement of oil through soils and aquifer systems would depend on the viscosity of the oil, soil and aquifer permeability, and the depth and hydraulic gradient of the water table. Because the typical Alaskan crude oil is considerably more viscous than water at 68°F, the rate of oil movement through soils and aquifers would be proportionally slower than that of water. Where the depth to the groundwater table is great, oil may be immobilized by processes of absorption and adsorption before reaching the water table.

In most sedimentary deposits, materials of variable permeability are deposited in horizontal layers or bedding. The effects of bedding on the vertical seepage of oil through unsaturated soils are important because permeability can be much greater in the horizontal direction than vertically. This effect would tend to make the oil spread laterally, thus allowing more oil to be immobilized before the seepage front reached the water table than would occur in a homogeneous, nonlayered soil. Although oil may reach groundwater aquifers most directly by spills at stream crossings, direct movement through soils is possible. The average annual quantity of oil that is likely to be spilled on land, for the entire pipeline route, is 1,200 barrels (subsection 4.2.17.D).

If oil from a pipeline rupture, spill, or leak were to reach the water table, then oil would float on top of the water table because of the lower density of the oil and the relative immiscibility of the two fluids. The oil would tend to spread out over the water table surface and flow downgradient in the same direction as the water but at a much slower flow rate. Some fractions of the crude oil would be water soluble. These soluble fractions would mix with and move at the same rate as groundwater until they became immobilized by soil particles, were biochemically degraded, left the groundwater regime as volatile gases, or were discharged with contaminated water to wells or springs.

Because of the slow movement of crude oil through soil and aquifer materials, the effects of groundwater contamination can be long term in comparison to oil spills in surface waters. Cleanup of contaminated groundwaters is expensive, time-consuming, and sometimes uncertain because of complex geologic conditions. Oil immobilized by soil absorption may be remobilized by percolating recharge water or seasonally rising groundwater tables. Remobilization could occur by processes of displacement of oil from soil pore spaces and dissolution of the soluble fraction of the crude oil.

In addition to water quality problems associated with oil contamination of groundwater, hazards of fire and explosion would also be possible. Occurrence of these impacts would be less probable than leaks or spills. This impact would be limited to developed areas where explosive gases or liquids could accumulate in wells, basements, or excavations. For explosive gases to accumulate, a confining layer of impervious soil or pavement must overlie the body of escaped crude oil.

C. POLA to Blythe

As discussed in subsection 3.2.5, groundwater forms a significant part of the water supply in southern California. Of the nine groundwater basins, four are considered to be sensitive to the effects of oil spills from pipeline operation. The Los Angeles Basin underlies the pipeline route for approximately 30 miles. Significant impacts could occur as a result of leaks along the route with direct percolation into the ground or via spills into the Los Angeles River with subsequent migration to groundwater. Any contamination of groundwater supplies in the Los Angeles urbanized areas would be highly significant because of the large numbers of people potentially exposed. Similar modes of contamination could occur for the Santa Ana Valley, which is very well developed for municipal and irrigation uses. The Coachella and Palo Verde Valleys are all sensitive to oil spill contamination because of their shallow depth to water and well-developed use for agricultural purposes.

D. Blythe to Midland

Significant groundwater quality degradation could occur in the event of pipeline leaks or spills in nine sensitive groundwater basins that are crossed by the proposed pipeline in this segment. The crossings of the Palo Verde and Rio Grande Valleys are probably the most sensitive of these areas because of the shallow water table and high degree of use for municipal and

irrigation supplies. Other sensitive basins include Centennial, LaPosa, Lower Santa Cruz, San Pedro, Sulfur Springs Valley, San Simon, Animas/Lordsburg Valleys, and the Mimbres Valley (BLM, 1984a, p. 4-37).

Between Pine Springs and Midland, both the Pecos River Basin and the aquifers underlying the pipeline in the Texas Basin are considered to be sensitive to the effects of potential pipeline leaks or spills. Both basins have fairly shallow depths to water table and are moderately well developed for municipal and some irrigation uses. The soils are generally sandy, thus permitting rapid downward percolation of oil to the aquifers.

E. Summary of Groundwater Impacts

Significant groundwater impacts could occur during operation of the pipeline. These impacts would include groundwater contamination by the introduction of crude oil that would occur only in the event of pipeline leaks, ruptures, or spills. Although the probability of these events is low (see subsection 4.2.17), their occurrence may be significant in terms of groundwater impacts. The greatest potential for groundwater problems is associated with small undetected leaks in the pipeline. This is due to the larger probability of occurrence, relatively small amount of oil needed to contaminate a water supply, the long-lasting effects of such a leak, and the difficulty of aquifer decontamination. Major spills, ruptures, and detectable leaks could probably be cleaned up before significant groundwater contamination results and have lower probabilities of occurrence than smaller leaks.

4.2.6 FRESHWATER BIOLOGY

Major impacts to aquatic resources would occur if critical habitat for important fish species of recreational and/or threatened and endangered status is affected by increased sedimentation or removal during construction, on a long-term basis (greater than 1 year or one life cycle); a major oil spill affects a large portion of important spawning or rearing areas of important fishes (game fishes, threatened or endangered species, or native nongame fishes); a major oil spill is toxic to a large portion of important permanent resident fish populations (temporary residents could be replaced during future high-water periods); or a major oil spill occurs in a small stream or backwater area of a larger stream.

Impacts to fish and other aquatic communities from construction and operation of the pipeline at stream crossings would vary depending on the time of year, physical characteristics of the stream (e.g., substrate, flow, and/or channel configuration), and type of fishery. The following discussion describes the general nature of the impacts that would result from the project's construction and operation phases. Specific impacts are described for particular stream crossings in each pipeline segment.

A. Construction

Primary impacts on the aquatic environment resulting from construction activities during low flow in the summer include substrate removal, increased sedimentation, and habitat alteration. The effects of these primary impacts on aquatic biota include the reduction in plant (algae and macrophytes) and benthic macroinvertebrate abundance and the displacement and possible reduction in resident fish populations. Reduction in fish population would result if important spawning or juvenile rearing areas were covered with sediment or removed from the stream. Other impacts may include a decrease in DO and the release of nutrients due to the disruption of bottom materials. The impacts would be short term in duration, generally less than 1 year or one life cycle for fish and several months for other aquatic communities. Sediments deposited downstream from the crossing site would be resuspended, along with naturally occurring sediment, during the next period of high discharge (usually in the winter) (BLM, 1984a, p. 4-38). Removal of riparian vegetation would adversely affect permanent fish populations if removed from long sections of a stream. Water temperature is affected by shade provided from riparian vegetation.

Some streams that only carry water periodically may contain pools year-round. Aquatic species supported by these pools could be impacted by construction upstream if loose soil and/or oil are left in the streambed to be carried downstream during the intermittent stream flows.

A spill of fuel or lubricant (necessary for operation of construction equipment) in the vicinity of a stream would be a concern during construction. The volume of fuel spilled should be relatively small, which would reduce the risk to aquatic organisms. If a spill did reach a stream containing important fish species (Table 4.2.6-1), significant impacts could occur due to direct toxicity or damage to important habitat. The extent of

Table 4.2.6-1 - Streams Where a Major Oil Spill Could Measurably Affect Important[a] Permanent Resident Fish Populations

Pipeline Segment (stream/state)	Species Potentially Affected
POLA to Blythe[b]	
Santa Ana River, California	Bluegill Largemouth bass Channel catfish Santa Ana sucker Arroyo chub Speckled dace
Colorado River, California and Arizona	Black crappie Bluegill Channel catfish Green sunfish Flathead catfish Largemouth bass Razorback sucker[b] Redear sunfish Striped bass Yellow bullhead
Blythe to Midland	
Gila River, Arizona	Bluegill Channel catfish Largemouth bass
Hot Springs Canyon and Bass Canyon Creeks, Muleshoe Ranch Preserve, Arizona	Gila chub[c] Longfin dace Speckled dace Desert sucker Sonora sucker
Rio Grande, New Mexico	Bluegill Channel catfish Flathead catfish Largemouth bass Mexican tetra[b] Rainbow trout
Pecos River, New Mexico	Bluegill Channel catfish Flathead catfish Largemouth bass White bass

[a]Important species defined as game fish, threatened or endangered, or native nongame fish (Bass Canyon and Hot Springs Canyon Creeks only).
[b]The Whitewater River is not included because of the lack of important resident fish populations.
[c]Threatened/endangered species or candidate species.
Source: BLM, 1984a, pp. 4-40 to 4-41; Hoover, 1985.

damage and duration would depend on the volume of fuel or lubricant reaching the stream, physical characteristics of the stream, sensitivity of organisms present, and time of year. The effects of a fuel or lubricant spill on aquatic communities would be generally similar to operational spills. Another potential impact during construction would be increased fishing pressure from construction personnel. Impacts should be short term (several weeks) and would not constitute removal of significant numbers of game fish if fishing regulations are enforced.

B. Operation

The major concern during pipeline operation would be an oil spill near or at a stream crossing. The probability of occurrence, use of automatic block valves and check valves, and oil spill contingency plans indicate a low oil spill risk. However, if a spill occurred, impacts to aquatic resources could be significant. The level of impact to aquatic resources in terms of duration and length of stream reach affected would depend on the size of the spill, time of year, physical characteristics of the stream (e.g., bottom substrate, flow, and channel configuration), cleanup and control techniques, and susceptibility of the dominant or important aquatic organisms to oil. Spills in small streams would likely be more persistent in their negative effect. After the oil has degraded, aquatic communities would be able to return to prespill conditions by recolonization from unaffected areas (BLM, 1984a, p. 4-39).

Cheremisinoff and Morresi (1977) describe recovery periods of usually 2 months for benthic macroinvertebrates and several months to 2 years for fish. Studies on a crude oil spill in the North Platte River in Wyoming showed benthic macroinvertebrates almost totally eliminated, but no fish mortalities were observed (EPA, 1982). However, fish flesh did exhibit disagreeable odor and taste for about 2 months after the spill (tainting). Oil concentrations on the river surface ranged from 2.8 to 8,195 mg/liter immediately after the spill but were below 10 mg/liter after 7 days. Dissolved and emulsified oil in the water column never exceeded 10 mg/liter. The study also showed that benthic macroinvertebrate communities recovered at most sites after 2 months.

In general, oily substances are harmful to fish and other aquatic organisms. Several mechanisms are involved in the toxic action of crude oil to fish. Oil film on the water surface prevents gas exchange between air and water. Oil coating gill surfaces interferes with the gas exchange between blood and water and can cause tissue deterioration. If sufficient oil is present, it may cause oxygen depletion due to bacteriological degradation. The water-soluble fraction in crude oil (hydrocarbons, metals, etc., see subsection 4.2.15.G) leaches in water and is toxic to fish (Wilber, 1969). Toxicity studies using water-soluble fractions in crude oil have shown that salmonids, striped bass (Morone saxatilis), and slimy sculpin are quite sensitive, while channel catfish and bluegill appear to be tolerant (BLM, 1984a, p. 4-42).

Killing of larvae and eggs that float on the surface film of water, as well as the destruction of planktonic plants and animals on which larvae and adult fishes feed, are deleterious conditions for aquatic systems. The presence of

oil would have severe impacts on spawning by rendering spawning grounds unfit.

C. POLA to Blythe

1. California. Construction impacts to aquatic environments would result from clearing of some riparian vegetation, substrata disruption, and temporarily increased siltation. Construction impacts to aquatic environments would be minor and short term. The proposed pipeline route would involve few aquatic environments in southern California.

Pipeline construction across streams whose physical structure have been greatly altered (e.g., the Los Angeles River, Rio Hondo, and San Jose Creek) would create little impact to aquatic systems. Most aquatic systems crossed by the proposed pipeline in this segment support marginal sport fisheries. A large spill into the Whittier Narrows Recreation Area or the Santa Ana River would be a major impact to fish and a significant impact to riparian habitat.

2. Colorado River. As a result of a major oil spill, important fish populations would be significantly affected in the Colorado River (Table 4.2.6-1). Considering the available information on oil toxicity to fish, striped bass could be the most susceptible species (Table 4.2.6-2). Considering the large volume of water in the Colorado River, major impacts would occur in the backwater areas located immediately downstream from about the proposed crossing (BLM, 1984a, p. 4-42).

Construction-related activities may result in the loss of individual Colorado squawfish, bonytail, or humpback (razorback) sucker, as well as the alteration of habitat.

D. Blythe to Pine Springs

A major oil spill would significantly affect resident fish populations in the Gila, Rio Grande, and Pecos Rivers; and Bass Canyon and Hot Springs Canyon Creeks in the Muleshoe Ranch Preserve. Fish populations would recover within several months to about 2 years in all streams, except those in the Muleshoe Ranch Preserve. If the oil spill affected a major portion of the Gila chub population in these streams, the recovery time could be longer than 2 years (BLM, 1984a, p. 4-44).

Construction impacts would be similar to those described previously. Restricting the period of construction to early winter (November to February) would cause the least interference with spawning and rearing of young by Gila chub on the Muleshoe Ranch Preserve (Brooks, 1985, personal communication).

E. Pine Springs to Midland

No perennial streams are crossed in Texas. A major oil spill at the Pecos River crossing in New Mexico might significantly impact fish populations in the river and Red Bluff Reservoir located downstream from the crossing.

Table 4.2.6-2 - Acute Toxicities of Water-Soluble Compounds in Crude Oil for Juvenile Fish (mg/liter)

Species	Water-Soluble Fractions	Benzene	Naphthalene	Toluene	Literature Source
Cutthroat trout	0.52	NA	NA	NA	Woodward et al. (1981)
Striped bass	2.0-11.0	5.1	NA	6.3	Benville and Korn (1977); EPA (1980a,c)
Slimy sculpin	3.0	NA	NA	NA	Moles et al. (1979)
Threespine stickleback	>6.89	NA	NA	NA	Moles et al. (1979)
Bluegill	No mortality at 1:9 mixture (oil: water)	22.5	NA	12.7, 24.0	EPA (1980a,c) Mitchell and Bennett (1972)
Channel catfish	No mortality at 1:9 mixture (oil: water)	NA	NA	NA	Mitchell and Bennett (1972)
Rainbow trout	NA	5.3	2.3	NA	EPA (1980a,b)
Mosquitofish	NA	386.0	150.0	NA	EPA (1980a,b)

NA = not available.
Source: BLM, 1984a, p. 4-43.

F. Threatened, Endangered, and Special-Status Species and Communities

The humpback (razorback) sucker (Xyrauchen texanus), a federally listed candidate species, is known to occur in the Colorado River near Blythe as well as downstream to the Senator Wash Reservoir. The bonytail (Gila elegans) and the Colorado squawfish (Ptychocheilus lucius), once common inhabitants of the Colorado River, are mostly extirpated from the lower reaches of the river. Losses of individuals through construction or operation of the pipeline would be a significant impact due to the rarity of these species.

Construction in the Muleshoe Nature Preserve may significantly impact spawning and rearing of Gila chub. Restricting construction in the Muleshoe Nature Preserve to early winter would cause the least interference with spawning and rearing of Gila chub. An oil spill into the Bass Canyon and Hot Springs Canyon Creeks would be a significant impact if the spill affected habitat of the Gila chub in these streams.

Losses of Mexican tetra (Astyanax mexicanus) may occur in the Rio Grande or Pecos Rivers during construction or because of an accidental oil spill. The sensitive status of this species makes losses of individuals a major impact. The Pecos gambusia (Gambusia nobilis) is not expected to be impacted by the pipeline crossing at the Pecos River because it only occurs in streams, springs, and the main river upstream from the crossing.

G. Summary

Temporary impacts to aquatic communities from construction of the pipeline at waterways include substrate removal, increased sedimentation, habitat alteration, reduced plant (including riparian) and benthic macroinvertebrate abundance, and displacement and possible reduction in resident fish populations. Streams where a major oil spill during pipeline operation could significantly affect important fish populations include the Santa Ana, Colorado, Gila and Pecos Rivers, Hot Springs Canyon and Bass Canyon Creeks, and the Rio Grande. Sensitive species that may be impacted include the humpback sucker, bonytail chub, Gila chub, and Mexican tetra.

4.2.7 TERRESTRIAL BIOLOGY

Major impacts to terrestrial resources occur if, after following construction specifications, revegetated areas would not have adequate ground cover to control soil erosion at preconstruction levels or if adequate cover is not provided for species that are useful in the postdisturbance land use. In other words, species making up the revegetated area cannot be dominated by noxious weeds, and the area must be able to support future land uses such as grazing, agricultural development, or wildlife habitat.

Other major impacts occur if riparian vegetation, live oaks, rare cactus, wetlands, or other communities or plant species considered to be rare, unique, or sensitive by Federal, state, or local agencies are lost (consistent with Executive Order 11990, Protection of Wetlands, May 24, 1977) or if critical ranges or habitats (e.g., wintering areas, lambing grounds, migratory routes, dens, breeding grounds, and nests) of sensitive species are affected during the season of use. Impacts to federally listed, threatened, or endangered species would be considered significant if the biological assessment required under Section 7, Endangered Species Act, determines that a species is in a "may-affect" category. A biological assessment is currently being prepared. Potential may-affect relationships are discussed in the draft EIR/EIS. The FWS biological opinion will be included in the Final EIR/EIS.

A. Construction

Construction procedures include the use of up to a 100-ft-wide ROW used for trenching, stockpiling backfill, pipe assembly, and equipment movement. Some plants would be completely removed by trenching, clearing, and crushing; others may be damaged but would survive. Limited revegetation of disturbed areas would occur after construction ceased. The time required to recover to preconstruction status would depend on the recovery potential of the plant communities and succession rates. Generally, wetter sites along the proposed pipeline route would have a greater and faster recovery potential than drier sites. Because of the arid nature of the region, regeneration may be extremely slow and would result in the loss of wildlife habitat as it existed prior to disturbance. Wildlife species occupying the disturbed areas would reflect the changes in vegetation composition as the site resumes the natural progression toward climax, albeit slowly.

The magnitude of short- and long-term impacts on terrestrial wildlife created by construction of the proposed pipeline reflects the degree of disturbance to plant communities. Excavation affects burrowing species such as estivating toads, pocket gophers, and pocket mice. Construction of the pipeline would result in the direct death or displacement of animals in the ROW. Small mammals, amphibians, and some reptiles with limited mobility would be killed by habitat clearing, earth removal, and equipment movement. The group of animals most susceptible to disturbance is the relatively immobile invertebrate. Other impacts would include the temporary displacement of wildlife within the ROW and the inhibition or halting of reproductive activities as a result of nest destruction, individual displacement, or physiological stresses. Halting and inhibition of reproductive activities

could also occur as a result of increases in noise levels associated with construction and operation of the project.

Construction impacts would vary depending on the season during which construction takes place. Winter construction in areas inhabited by waterfowl and marsh birds may force birds to less favorable areas. Construction during the nesting season may cause nest desertion, even by birds in adjacent areas not directly affected by construction. Construction would eliminate bird habitat along the ROW and would be especially significant in riparian areas with high nesting populations.

Larger, more mobile animals would be able to leave and avoid the construction area. Noise and general human disturbance would preclude most large animals during construction. The cleared ROW may temporarily provide a barrier to normal movement patterns and fragment habitat in previously undisturbed areas. Short-term displacement of animals for which small, nonessential areas of habitat are destroyed as a result of the project is generally not considered as significant an impact. Impacts would be significant if construction displaced animals in critical habitats or at a critical time of the year (e.g., bighorn sheep lambing areas or birds during the nesting season). Temporary displacement of animals in the ROW may result in death if an essential component, or access to an essential component of the animal's habitat, is destroyed in the process. Generally, it is unlikely that an animal will find an unused replacement for the essential component. Examples of essential components of an animal's habitat that may be destroyed by construction include den sites, resting areas, and cover sites. Construction activity could also inhibit access to food and water, even for larger animals.

The increased use of vehicles and the presence of man in previously remote areas would increase the risk of wildlife harassment, illegal hunting, and the removal of sensitive or commercially valuable plant species such as cactus. Because of the increased accessibility, increased ORV access would also stimulate the destruction of parts of existing plant communities outside the proposed ROW. Where construction would affect federally listed threatened, endangered, or sensitive species or sensitive habitat, impacts would be considered significant.

B. Operation

Terrestrial plant communities could be directly and indirectly affected by oil spills. Oil in the soil can reduce the availability of water to plants and cause plant mortality because of direct oil contact (Hutchinson et al., 1974). Direct contact of oil with the plants can cause loss of foliage, reduced photosynthesis, reduced nutrient levels, reduced flower and seed production, and toxic effects on cells (Hutchinson et al., 1974). In areas where plants have been killed by oil at a dosage of 0.1 to 0.9 gallon per square yard (gal/yd^2), 2 to 3 years may be required before plant life can become reestablished (Schwendinger, 1968). Indirect impacts can result from cleanup efforts such as burning, clearing of oiled vegetation, or removal of topsoil. Plant regeneration is best on well-drained soils. The impacts to

trees and shrubs can be less severe if root systems are oil-free and well aerated. Impacts of oil when deciduous plants are in leaf are generally more severe than when they are dormant.

Little information exists on the effects of oil on wildlife in desert areas. The timing (season), species of wildlife involved, and volume of the spill would determine the magnitude of the impacts to terrestrial resources; spills in waterways are generally more severe than spills on land. In general, spills in freshwater systems pose greater threats to terrestrial wildlife than land spills. Two examples of large spills in freshwater systems are documented for the Sagavanirktok River and the North Platte River. At Prudhoe Bay, a 2,000-barrel oil spill occurred in and along the Sagavanirktok River, killing some vegetation and oiling some birds and foxes. No dead wildlife was found, and new vegetation along the river began to grow in 10 days (Anderson, 1983). However, an 8,552-gallon oil spill on the North Platte River in Wyoming caused the death of 335 birds (mainly waterfowl) and 33 mammals (primarily beaver and muskrat) (EPA, 1982).

Waterbirds (e.g., marshbirds and waterfowl) and aquatic mammals such as muskrat and beaver can be directly affected by an oil spill through:

(1) Physical contact with oil
(2) Ingestion of oil
(3) Loss of food or habitat

Birds with oiled plumage can get so waterlogged they cannot fly and may drown (Nelson-Smith, 1972). Oiled aquatic mammals can lose water-shedding qualities in their fur, resulting in death from exposure. Waterfowl can ingest oil through preening, resulting in loss of appetite, sickness, and death from a combination of starvation and exposure (Hartung, 1967). Poor hatching success may also result when eggs are incubated by oiled birds (Hartung, 1965). If a food source or essential habitat is impacted by oil, waterbirds may die or become weak attempting to find alternative sources of food or habitat (Nelson-Smith, 1972).

The operation of the pipeline, primarily because of increased ORV access, would increase the risk of wildlife harassment, illegal hunting, and the removal of commercial plant species (cactus) in remote areas. Operational maintenance may slightly increase the risk of fire in desert grasslands and chaparral. No adverse impacts to vegetation and wildlife are expected from air emissions from construction equipment, dust, pump stations, and tank farms.

C. Abandonment

Several options are possible for pipeline abandonment. The option resulting in the most impact to vegetation and wildlife would be the removal or salvage of pipe. For this option, pipe would be removed at all locations, except at stream crossings and major pipe bends. The expected impacts from abandonment would be similar to construction impacts but generally less severe. Digging up the buried pipe would disturb revegetated ground cover on the ROW. The ground cover would most likely be comprised of grass and/or shrub species.

Given the small area removed by trenching to remove pipe, the loss of vegetative productivity would be minimal. Some loss of small mammals may result from clearing, and larger animals would be displaced and disturbed by increased human activity along the ROW.

D. POLA to Blythe

1. Vegetation. The proposed pipeline route between POLA and the Beaumont-Banning area would pass through primarily urbanized and agricultural areas. In the metropolitan area, the route would follow concrete-lined channels and railroad ROWs; in agricultural areas, it would follow railroad, county, or state road ROWs. Natural vegetation in these channels and ROWs is generally lacking.

Vegetation in the Whittier Narrows Basin, San Gabriel River, Santa Ana River, and San Timoteo Canyon provide important riparian habitat and are the main areas of potential impact. The occurrence of riparian habitat in an otherwise urban environment and the relatively small acreage involved make the importance of these areas even greater. Existing and potential southern California riparian habitat is already heavily impacted by rapid water level fluctuations and eradication programs for noxious weeds. Riparian vegetation and potential least Bell's vireo habitat immediately downstream of the Whittier Narrows Dam would be disturbed by construction activities. The Santa Ana River crossing recently supported a substantial riparian community. Flood control activities in the area have resulted in the temporary loss of this community. Most riparian vegetation in San Timoteo Canyon is confined to the heavily cut creekbed and would experience significant disturbance where construction occurs in the creekbed. The area where the pipeline would cross San Timoteo Wash supports a narrow riparian community that lacks the large trees common to the riparian community downstream. Most construction in San Timoteo Canyon will result in the disturbance of coastal sage scrub, agricultural land, and previously disturbed land not under cultivation. Maps of California river crossings are presented in Appendix J. Loss of riparian habitat would be a significant impact.

The Puente Hills-Diamond Bar area still supports some coastal sage scrub, chaparral, California grassland, and southern oak woodland communities. Rapid urbanization is quickly reducing the area occupied by these communities. Removal of southern oak woodland would be the most noted impact in this area because of the remnant nature and slow regeneration period of this community.

Pipeline construction from the Beaumont-Banning area to Blythe would result primarily in the removal of creosote bush scrub, transitional cactus scrub, and wash woodland communities. Slow recovery of these arid communities to preconstruction status is anticipated.

The removal of riparian vegetation at the Colorado River crossing would be considered a significant impact. (Appendix J-4 depicts the Colorado River pipeline crossing.)

Vegetation areas most sensitive to oil spills would be Whittier Narrows Flood Control Basin, lower San Gabriel River, Santa Ana River, and San Timoteo Canyon. Riparian vegetation in each of these areas would be affected adversely. Downstream regions of the Santa Ana River, particularly Hidden Valley Park and Prado Dam County Park, would be significantly impacted in the event of an oil spill. Oil spills on desert vegetation would be less severe because of the relative sparseness of the vegetation. One exception would be the sensitive palm oasis community near Indio.

2. Wildlife. The magnitude of construction impacts on wildlife strongly reflects the degree of vegetation disturbance, as well as animal mobility. Most amphibians encountered along the proposed pipeline are found in riparian or otherwise relatively moist habitats. Because few riparian areas would be crossed in California, the impacts to this group should be minimal. Localized impacts may occur in the Whittier Narrows Basin, Santa Ana River, San Timoteo Canyon, and at the Colorado River crossings.

Impacts to sensitive reptile species in southern California through the loss and alteration of critical habitat, direct mortality, and den and nest destruction may be significant (see subsection 4.2.7.G).

Construction impacts on bird life can be variable. Winter construction in areas inhabited by waterfowl and marsh birds would likely force these species to inhabit less favorable areas. Construction during the nesting season may cause nest desertion even by birds in adjacent areas not directly affected by construction. Waterfowl, shore, and marsh bird habitat would be temporarily lost until revegetation occurs. Construction in urban areas may affect wildlife if construction would pass through or near parks (such as the Whittier Narrows Basin). Avian habitat along the pipeline route in nonriparian desert areas would essentially be lost because of the low recovery period exhibited by arid vegetation. Construction in the palm oasis or wash woodlands may eliminate bird habitat through direct habitat destruction or, indirectly, by altering water flow necessary to sustain plant life. Construction in riparian areas would directly eliminate bird habitat.

The relative mobility and low population density of most mammals in southern California would result in only a small number of individuals lost directly by construction. Destruction of nest or den sites and habitat would have greater impact but would be confined to the construction ROW. Most large mammals in southern California exhibit habitat preference and/or behavior that generally preclude occurrence in the proposed pipeline area.

Most terrestrial animals would be impacted by an oil spill chiefly as a result of habitat and food supply loss. Adverse impacts may occur to amphibians and birds of riparian areas. Mobile species should not experience adverse impacts because of an oil spill.

E. Blythe to Pine Springs

1. Vegetation. Construction along this pipeline segment would result in the removal of communities from predominantly Sonoran desert scrub,

Chihuahuan desert scrub, and semidesert grassland vegetation types. As is typical of desert communities, natural revegetation in these disturbed areas would proceed slowly.

Commercially valuable cactus occurs along the proposed route and would be salvaged, where practical. The loss of commercially valuable species would be minimal (BLM, 1984a, p. 4-55). Where substantial riparian vegetation occurs at stream crossings, loss of this habitat would be significant. Whereas the San Pedro River provides riparian habitat along much of its course, riparian cover is lacking at the proposed crossing. The Muleshoe Nature Preserve, managed by the Arizona Nature Conservancy, has unique riparian communities in Bass Canyon, Double R Canyon, and Hot Springs Canyon. These communities are now rare in the southwestern United States and provide nesting habitat for rare bird species.

If in the event of an oil spill oil reached Wildcat Canyon Creek, Bass Canyon Creek, and Hot Springs Creek, herbaceous riparian vegetation would likely be killed. Trees may be affected if oil reached the root zones. An oil spill in this area would be a significant impact. Block and check valves placed in critical habitat areas would reduce the volume of oil that would be released in the event of an oil spill.

2. Wildlife. Construction along this segment of the proposed pipeline would displace large, more mobile, wildlife species and would displace or kill small mammals and reptiles (see subsection 4.2.7.A). Although riparian vegetation is lacking at the San Pedro River crossing, riparian habitat along other reaches of the stream is considered sensitive habitat for nesting raptors. An oil spill in this reach may adversely impact these birds (Weaver, 1985, personal communication).

Little information exists on the effects on wildlife of oil pollution in water. Studies in which domestic livestock were given drinking water polluted with crude oil showed adverse effects attributed to the laxative property of the oils (Wilber, 1969).

F. Pine Springs to Midland

1. Vegetation. Construction along this pipeline segment would result in the removal of communities from predominantly Trans-Pecos desert scrub and semiarid short-grass prairie. Impacts to vegetation would be similar to those described previously. Riparian vegetation consisting primarily of saltcedar would be removed at the Pecos River crossing.

2. Wildlife. Impacts to wildlife along this pipeline segment would be similar to those described previously.

G. Threatened, Endangered, and Special-Status Species and Communities

A listing of the state and Federal status of sensitive species is presented in Table I.1-1.

Plant candidate species known to occur in the Coachella Valley area along the proposed pipeline route include the Coachella Valley milk vetch and the Little San Bernardino Mountain linanthus. Flatseeded spurge occurs along the Coachella Valley Alternative. California ditaxis occurs along the route near Lost Palms Canyon (Knehr, 1985). One of the few known populations of Nevin's barberry (Mahonia nevinii) occurs in the chaparral/coastal sage scrub of San Timoteo Canyon (Krantz, 1985).

Several populations of the endangered Sneed's pincushion cactus occur near the pipeline route at Anthony Gap in the Franklin Mountains (Olwell, 1985b). Loss of cacti from trenching or crushing by construction equipment, or from an oil spill, would be considered a significant impact. Field investigations in May 1984 found hybrid individuals (C. sneedi x C. strobiliformis) of the Sneed's pincushion cactus near, but not in, the All-American ROW at the Anthony Gap area (BLM, 1984a, p. 4-56).

Field studies are needed to determine the occurrence of Coachella Valley milk vetch, Little San Bernardino Mountain linanthus, flatseeded spurge, California ditaxis, Nevin's barberry, Lloyd's hedgehog cactus (Federal-endangered), McKittrick pennyroyal (Federal-threatened), gypsum wild-buckwheat (Federal-threatened), and Sneed's pincushion cactus in the Pactex ROW. Presence in the ROW would result in the destruction of individuals or possibly populations of a sensitive species and would be a significant impact.

Stephens kangaroo rat, known from the badlands southwest of San Timoteo Canyon, would be strongly impacted if construction occurred in one of the few remaining habitats of this species.

The Coachella Valley harbors several threatened/endangered species and species of concern. Most of these species are closely associated with and adapted to the unique blowsand ecosystem of the valley. Vertebrates include the Coachella Valley fringe-toed lizard (CVFTL) (federally listed as threatened), Coachella round-tailed ground squirrel, and flat-tailed horned lizard. The flat-tailed horned lizard (a Federal candidate species) occurs in sandy washes and creosote bush scrub. The Coachella round-tailed ground squirrel occurs on the edge of irrigated areas with access to blowsand. The CVFTL, precisely associated with the blowsand ecosystem, is threatened with extinction by loss of habitat. The proposed pipeline would nearly bisect the region identified by the Fish and Wildlife Service as critical habitat and designated by the CVFTL Habitat Conservation Plan (CVFTL HCP) as the Coachella Valley Preserve (see Figure 3.2.7-3). These animals may be directly impacted by mortality during construction. The CVFTL HCP identifies utility ROWs, including pipeline ROWs, as compatible uses. Excavation for installation is followed by backfilling, and the area would be allowed to revegetate. Restricted public access and land use over the ROW may form corridors of natural open space frequently alongside transportation ROWs. "Unless pipeline ROWs lie on the shielded side of windbreaks, they may serve as fringe-toed lizard habitat" (CVFTL HCP, 1984). Field assessment in 1985 indicated that the proposed pipeline route would disturb approximately 0.4 mile (5 acres) of habitat which, at the date of survey, appeared to satisfy the habitat characteristics necessary for occupation by CVFTL. Because of the

dynamic processes of the blowsand ecosystem, other potentially occupiable habitat along the route may become attractive to CVFTL in the future. Loss of individual CVFTL would be a significant impact.

The San Diego horned lizard, orange-throated whiptail, and Gila monster (Category 2 candidate species) would be directly impacted if present in the pipeline ROW during the construction phase. Loss of habitat in the ROW would be a minor impact.

The desert tortoise, a federally listed Category 2 candidate species, is given special legislative protection in California (CDFG Code, Section 5000-5002) because of its vulnerability to vandals, disturbance of its habitat, low rate of natural replacement, and popularity as a pet (Figure 3.2.7-1). The desert tortoise also occurs along the proposed route in western Arizona. Desert tortoises would be vulnerable to disturbance when they are underground during their winter hibernation period between October and March, during daily estivation periods, and during surface movements in the spring. Surface movements usually begin in late March or early April. Hibernating or estivating tortoises could be crushed by the trenchers, curied by backfilling equipment, or die from injuries or exposure to predators. Active tortoise could also be killed by falling into the open pipeline trench or by being crushed by equipment clearing vegetation or moving pipe. During operation of the pipeline, an oil spill could also kill to tortoises in their burrows. Increased access, poaching, and ORVs could also impact the tortoise. The loss of individual tortoises would be significant because of their low reproductive rates and the time needed to reach maturity.

The proposed pipeline route would pass between ranges harboring bighorn sheep populatitons in California (Figure 3.2.7-2). Construction is not expected to impact sheep because the route would follow desert valley areas below elevations used by bighorn sheep. The pipeline, which would closely parallel existing highways, would not be a barrier to any migration routes.

In Arizona the route would not cross sheep migration corridors, watering holes, or lambing areas. However, it would come within 2 miles of the Lazarus tank lambing ground north of I-10. Construction blasting through the Plomosa Pass area could significantly affect lambing ewes if construction occurred during the lambing season. I-10 is currently a major barrier to sheep movement in the Plomosa Mountains; therefore, a pipeline following the interstate should not affect sheep movements. The route would pass near the Black Mesa rutting grounds, but impacts should not be significant because the route does not occur on the actual grounds and considerable elevation differences exist between the route and the rutting areas.

Construction of the proposed pipeline at the palm oasis would be a significant impact. Pipeline construction at Gypsum Dunes Preserve would temporarily disturb dunes, removing vegetation and displacing or killing animals. Construction across the dunes may temporarily change dune movement patterns. Given the small area of disturbance and the fact that the proposed ROW would follow an existing pipeline ROW, impacts to vegetation and wildlife would be minimal. Construction and operation of the pipeline should not significantly alter future management plans or use of the preserve by the public.

At Blythe, California, the pipeline would cross the Colorado River. Riparian habitat would be removed or disturbed during construction and may result in the loss of western yellow-billed cuckoo (candidate species) habitat. Most of the extensive manmade wetlands are downstream of the proposed crossing. Loss of riparian wetlands (primarily willows and salt cedar) from construction would be short term, and reinvasion of shrubs would occur within 1 to 3 years. Of greater concern would be the potential for an oil spill at the Colorado River crossing. Given the proximity of the downstream wetlands, it is likely this area would be contaminated by oil in the event of an accidental spill. The magnitude of the impact would depend on the volume of oil released, the flow in the river, and the season. At low flow conditions, backwater areas including most of the wetlands are separated from the river and would not be oiled. At higher flows, the mouth of these areas could be affected as well as several miles of downstream riparian vegetation.

If a spill occurred at the Colorado River during winter, up to 1,200 waterfowl could be affected (BLM, 1984a, p. 54). Oiled birds would likely die from exposure, increased stress, or ingestion of oil. If the spill occurred during the breeding season, nesting waterfowl and marsh birds would be adversely affected. Oiled adults and eggs would likely die, resulting in reduced population levels. If a spill were not immediately contained, it is possible that oil could reach Cibola and Imperial NWRs, 20 miles downstream of the Colorado River crossing. The endangered Yuma clapper rail and the California black rail occur in wetlands within these refuges. The loss of individual Yuma clapper rail or their habitat would be a significant impact.

An oil spill in the Colorado River in any season would be a significant impact. However, given the low probability of any spill along the route and the even lower probability of a spill at any given 1,000-ft water crossing, the risk of a spill is very low.

An oil spill may temporarily affect peregrine falcon prey species. A major spill would cause significant impacts if the spill were so large that most of bird prey species were killed and if the peregrine's use of oiled birds caused nest failures (as a result of coating eggs with oil or ingesting significant amounts of oil). The construction and operation of the pipeline near Hot Springs, Arizona, may impact nesting peregrine falcons. Nesting peregrine falcons in the Guadalupe Mountains should not be affected.

Construction and operation of the proposed pipeline is not expected to have a significant impact on migrating eagles along the California coast, at the Colorado River crossing, or at other major rivers in the region. The eagles at Santa Catalina Island, which are expected to begin nesting there in the near future, should not be affected by even a major pipeline oil spill. However, a major tanker accident in the vicinity of the island could reduce prey items and force eagles to forage farther from the island. This extended foraging range would be stressful to eagles. A major spill at the Colorado River crossing, near Blythe, California, could reach the Cibola or Imperial National Wildlife Refuges where a few eagles winter. A spill would significantly reduce waterfowl for a limited time and may reduce waterfowl habitat for a longer period. A spill would cause no direct impact to eagles

but may force them to feed in other areas farther downriver. Wintering eagles may take oiled waterfowl; however, no such records are reported in the literature.

Loss of riparian habitat at Whittier Narrows and San Timoteo Canyon may result in losses of least Bell's vireo. Oil spills into the habitat of this proposed endangered species would result in the temporary loss of habitat and possible loss of food sources. An oil spill into the Santa Ana River may significantly affect proposed critical habitat of least Bell's vireo downstream from the pipeline crossing. These impacts would be significant.

In Cochise County, Arizona, the pipeline would cross the Muleshoe Ranch Nature Preserve managed by the Arizona Nature Conservancy. The preserve has unique mixed broadleaf riparian communities in Bass Canyon, Double R Canyon, and Hot Springs Canyon. These riparian communities are now rare in the southwestern United States and provide nesting habitat for such rare species as the black hawk, zone-tailed hawk, gray hawk, and northern beardless tyrannulet. If construction occurred during the breeding season (approximately May through July), human presence could cause nest abandonment, a potentially significant impact. An oil spill into riparian zones in this area could significantly impact habitat of these bird species, as well as other species dependent on riparian zones. Properly placed block and check valves would significantly reduce the volume of oil that might be released.

In New Mexico, the pipeline would cross sensitive habitats near Lordsburg and in the Franklin Mountains near Anthony. The Chiricauhua leopard frog, a species of special concern, may occur on the Lordsburg Playa. It is unlikely that pipeline construction would affect this species because the pipeline does not affect any wetland habitats in this area (BLM, 1984a, p. 4-56).

Two candidate invertebrate species occurring in the Coachella Valley may be impacted by the proposed pipeline. Although the proposed route avoids known populations of the Coachella giant sand treader cricket and the Coachella Valley Jerusalem cricket, undocumented populations that may occur in the ROW would be essentially lost because of construction activities.

H. Summary

Pipeline construction would result in the removal of approximately 9,927 acres of wildland vegetation (see Table 4.2.7-1) and wildlife habitat along the 819 miles of the route not covered by urban or agricultural areas. Because of the arid nature of the region, limited revegetation of disturbed areas would occur. Impacts on terrestrial wildlife from pipeline construction reflect the degree of habitat disturbance and the nature of the animals. Temporary displacement of animals in the ROW may result in death if an essential component, or access to an essential component, of the animal's habitat is destroyed. It is unlikely that an animal will find an unused replacement for the essential component. Loss of habitat will greatly influence the presence of species and the long-term use of the ROW by species. Other impacts would include inhibition or halting of reproductive activities.

Table 4.2.7-1 - Summary of Major Vegetation Types
Along Proposed Pipeline Route

Vegetation Type	Miles	Acres
Chaparral - Coastal sage	23	279
Transition (desert-coastal)	9	109
Creosote bush scrub	127	1,539
Cactus scrub	4	48
Alkalai sink	2	24
Desert washes	19	230
Sonoran creosote bush	154	1,867
Arizona upland	62	751
Grama grass - Tobosa grass	24	290
Oak woodland - Chaparral	7	85
Salt playa	16	194
Chihuahuan creosote bush	115	1,394
Trans-Pecos desert scrub	33	400
Shin-oak mesquite	22	267
Mesquite grassland	62	752
Mesquite snakeweed	28	339
Semiarid short-grass prairie	22	267
Mesquite dune	89	1,079
Riparian	<1	-
Total	818	9,914

Source: ES, 1985.

Significant impacts that may result from an oil spill during pipeline operation include contamination of rare plants, animals, or habitat. The most adverse impacts from such an event would be felt in wooded areas, steep slopes, or in wetlands or riparian habitat. Waterbirds would be particularly sensitive because of their greater likelihood of experiencing any of the following impacts: physical contact with oil, ingestion of oil, and/or loss of food or habitat.

Sensitive communities along the pipeline route that may be impacted by either construction or oil spills during operation include the Whittier Narrows Recreation Area, San Timoteo Wash, riparian habitat, oak woodlands, dunes, wash woodlands (including the Chuckwalla Valley Dune Thicket), the Muleshoe Nature Preserve, and the Gypsum Dunes Preserve.

Federally listed threatened/endangered species that may be impacted by the proposed project include the least tern, brown pelican, peregrine falcon, Yuma clapper rail, Coachella Valley fringe-toed lizard, Lloyd's hedgehog cactus, Sneed's pincushion cactus, gypsum wild-buckwheat, and McKittrick pennyroyal. Federally listed candidate species, as well as state-listed and BLM-listed sensitive species (particularly the desert tortoise), may be adversely affected by the project (described in subsections 3.2.7.D and 4.2.7.G).

4.2.8 SOCIOECONOMICS

The assessment of socioeconomic impacts is based on the following considerations:

(1) The demand for and supply of project-related temporary housing within reasonable commuting distances.

(2) Permanent demand on the existing infrastructure.

(3) Change in the local tax base.

(4) Permanent change in area population in regard to population level and composition (race, age, sex or ethnicity).

(5) Permanent change in area employment levels.

The local and nonlocal composition of the construction work force was determined through assessing local skilled and unskilled labor force availability and reviewing literature such as the Pipeline Construction Worker Profile (Mountain West, 1979) and various EISs prepared for other pipeline projects. A local worker is identified as a worker who is able to commute to and from his permanent place of residence on a daily basis. A nonlocal worker is identified as a worker who has moved into the construction area for the duration of the project. Affected communities were identified along each pipeline spread region, based on commuting distance, access, driving time, and housing availability. The following regional analysis inventories temporary accommodations and major services and facilities. It also provides a description of the revenue sources to the counties potentially affected by the construction of the pipeline (BLM, 1984a, p. 4-58).

A. Construction

The peak construction work force would total 3,000 workers. Table 2.2.2-1 summarizes the total construction personnel requirements. The table does not reflect overlapping of construction activities.

The local and nonlocal labor force has been estimated for each of the seven spread regions based on available skilled and unskilled labor. The seven spread regions are represented by the following:

Pipeline Spread Region	Location
1	POLA terminal
2	POLA to Banning
3	Banning to Blythe
4	Blythe to Coolidge
5	Coolidge to Hueco
6	Hueco to Midland
7	Midland terminal

Both the California and the Texas labor forces have a fairly large contract construction employment sector and have trained and experienced pipeline workers in counties from which the labor force could be drawn. The labor force is assumed to comprise 65% local labor in Spread Region 2 and 50% in local labor in Spread Region 3. In Spread Regions 4, 5, and 6, local labor would represent 30% of the labor force. At POLA, 90% of the construction work force would be local, while 60% would be local at the Midland terminal construction site. Table 4.2.8-1 presents the breakdown of the local and nonlocal work force, time schedule, lodging requirements, and estimated worker expenditures for each spread region. Because there are no radical shifts in employment among sectors and the construction period is of a short duration, no significant employment impacts would occur. This includes the Indian reservations in Arizona and California that would be near the proposed pipeline ROW.

Because of the short duration of pipeline construction for any one spread region, ranging from 3.6 to 10.6 months, it is assumed that only 15% of the total nonlocal work force would bring their families. Based on information from the Pipeline Construction Workers and Community Impact Survey's Report, completed in 1979, only 0.3 dependent per worker is estimated for each spread, (BLM, 1984a, p. 4-64).

In general, the number of construction workers would be very small with regard to the regional population. The largest population impacts would occur in New Mexico and Texas along those portions of the route that are sparsely populated. The greatest increase in population from temporary settlement of construction workers would occur in the following locations: Hidalgo County, New Mexico = 7.0%; Hudspeth County, Texas = 16.3%; and Culberson County, Texas = 14.2%. The population influx would be of short duration, less than 1 year, and the population change would be less than 10% except for Hudspeth and Culberson Counties. Overall, no significant population impact would occur in the latter two counties, considering the very small existing population base, i.e., around 3,000 population each.

Total nonlocal population would not cause a significant long-term demand to any public or private infrastructure along the route, including police, medical facilities, fire, or educational services. There would be no significant impact on employment along any of the pipeline spread regions because of the short duration of the construction period. Temporary impacts could occur on stretches of the line that are sparsely populated, such as Hidalgo, Grant, and Luna Counties in New Mexico, as well as all of the rural counties (Hudspeth, Culberson, and Winkler) in western Texas. The intensity of these short-term employment impacts would depend on the location of the construction contractor and where he hires most of his work force. The largest increase in total employment would occur in Hudspeth County, Texas (14.9%) and Culberson County, Texas (10.2%).

Pipeline workers would be scheduled to work a 5 to 7 day week, 12 hours per day. If construction progress is on schedule, a 6-day work week would be applicable. A 5-day or 7-day work week would be dictated by whether progress is ahead of or behind schedule. The average non-overtime daily wage is estimated at $195 per worker.

Table 4.2.8-1 - Pactex Construction Work Force Summary by Pipeline Spread Region

Item	Spread Region						
	POLA (1)	POLA-Banning (2)	Banning-Blythe (3)	Blythe-Coolidge (4)	Coolidge-Hueco (5)	Hueco-Midland (6)	Midland (7)
Total miles	0	120	108	224	319	260	0
Milepost	0	120	228	452	771	1,031	1,031
Construction crew							
Pipeline	-	250	350	350	350	350	-
Pump station	50	-	50	50	50	50	-
River crossings	-	50	50	50	50	50	-
Terminals	300	-	-	-	-	-	300
Construction management	21	15	10	12	15	12	15
Pipe transportation	-	50	50	50	50	50	-
Total	371	365	510	512	515	512	315
Time schedule (months)							
Pipeline[a]	-	7.0	3.6	7.5	10.6	8.7	-
Pump station	4.0-6.0	-	4.0-6.0	4.0-6.0	4.0-6.0	4.0-6.0	-
River crossings	-	3.0	3.0	4.0	3.0	3.0	-
Terminals	18.0	-	-	-	-	-	12.0
Pipe transportation	-	1.5	1.0	2.0	2.5	2.0	-
Local labor force (%)[b]	90	65	50	30	30	30	60
Total	334	237	255	154	155	154	189
Nonlocal labor force (%)	10	35	50	70	70	70	40
Total	37	128	255	358	361	358	126
Dependents (0.3/nonlocal[c] worker)	11	38	77	107	108	107	38
Total nonlocal population	48	166	332	465	469	465	164
Lodging requirements							
Rental units	10	33	66	93	94	93	33
Motel/hotel	16	54	107	151	152	151	53
Recreational vehicle	10	36	72	100	101	100	35
Other	2	5	10	14	14	14	5
Weekly expenditures ($) by nonlocal labor force[d]							
Rental unit/motel dwellers	10,400	34,800	69,200	97,600	98,400	97,600	34,400
RV dwellers and others	2,400	8,200	16,400	22,800	23,000	22,800	8,000

[a]Pipeline progress from POLA to Banning proceeds at 600 ft/day; other segments proceed at 1 mile/day.
[b]Engineering-Science estimate.
[c]Construction Worker Profile, Mountain West Research, Inc., 1979.
[d]Rental unit and motel dwellers are estimated to spend $400/week; RV dwellers and others are estimated to spend $200/week.
Source: Pactex, 1985; ES, 1985.

Retail sales and sales tax receipts would increase throughout the pipeline service communities. Income would be generated in two areas:

(1) Income generated by the construction work force in the form of lodging, food, retail sales, and fuel.

(2) Income generated by the contractor for materials purchased in the local economy such as tools, fuel, parts, and repairs, where available.

These purchases are not quantifiable by location for the most part and, therefore, cannot be allocated to specific communities along the route. However, there would be a noticeable short-term economic impact to the communities along the route. Spending generated by the labor force, as well as purchases of local construction materials and supplies, would create a multiplier effect because initial expenditures are respent 1 to 2 additional times within the local economy.

The nonlocal work force living in rental housing is estimated to expend up to 37% of gross salary on local expenditures. These expenditures would increase income for local businesses and tax revenues for local communities (BLM, 1984a, p. 4-66).

Because construction would be short in duration, housing preferences would be of a temporary nature. It is generally accepted that pipeline workers prefer to stay in accommodations closest to the pipeline. It is assumed that housing for the nonlocal pipeline work force would be divided as follows (BLM, 1984a, p. 4-59):

Type of Housing	Housing Distribution (%)	Average Nonlocal Workers per Spread Region (excluding POLA and Midland)
Motel/hotel	42	123
Rental units	26	76
Recreational vehicle camper	28	82
Other	4	11
Total	100	292

Because construction progress would be rapid (up to 1 mile per day), housing preferences would be of a temporary nature. It is difficult to determine which communities would be most affected due to personal preferences for accommodations; some pipeline workers may prefer to travel extra miles per day in order to be located in a larger town with better accommodations and services, others may not. The estimated breakdown on housing for the nonlocal pipeline workers is shown in Table 4.2.8-1.

Some housing problems would occur along the Pactex pipeline route. Table 4.2.8-2 identifies communities with accommodations within commuting distances of the pipeline route. It also shows the total number of overnight rooms and recreational vehicle sites in the area. If all accommodations within each spread region are tallied, there would be more than adequate accommodations for the construction workers. If each spread region is divided into segments that represent reasonable commuting distances, there are two areas where housing availability would be lower. One major area of impact would be between Indio and Blythe, California. Indio and surrounding area has a very large supply of housing accommodations. Blythe, California, on the other hand, has limited overnight accommodations, currently totaling 488 rooms. If all nonlocal construction workers on the Banning-Blythe spread who prefer motel accommodations stayed in Blythe, 22% of the units would be occupied. Blythe is an important service center for Colorado River recreationists and experiences high occupancy rates during the peak tourist season from April through September. Construction worker demand would conflict with tourist demand. Rental housing would also be severely impacted if all workers who prefer to rent units would locate in Blythe.

Another area of potential impact to housing would be in Spread Region 6 between El Paso, Texas, and Jal, New Mexico. The stretch of pipeline that runs from El Paso through Hudspeth and Winkler Counties is approximately 160 miles long. There are very few overnight accommodations between these two points, particularly west of Pine Springs. Self-contained recreational vehicles would be able to camp along the route, but approximately 260 workers would be required to commute long distances daily. In general, western Texas provides few motel accommodations. The smaller towns closest to the pipeline, which do have accommodations, could experience 100% occupancies during the period of time construction workers would be in the area. This would inconvenience travelers who expected to stay in those locations overnight. Significant impacts will occur at some points along the El Paso-Jal corridor stretch of pipeline due to lack of adequate temporary accommodations within a commuting distance of 170 miles roundtrip.

B. Operation

The Pactex pipeline would permanently employ 162 people to operate and maintain the system.

The impacts of the proposed Pactex pipeline on the assessed property valuation of each county traversed by the pipeline are presented in Table 4.2.8.3. Each county would benefit from the increased tax base. The most significant increase in the total tax base, attributed to the Pactex pipeline and facilities, would occur in an increase in assessed valuation in the Arizona counties of La Paz/Yuma (11.0%), Pinal (12.1%), and Cochise (13.5%) and in Hudspeth County, Texas (14.2%). These are the only areas that would experience a change in the local tax base greater than 10%.

One other area of economic concern would be the possible loss of four to five anchorage positions at POLA caused by construction of the berthing island. POLA in 1984 realized an estimated $125,000 from anchorage fees. Loss of 15% to 20% of available anchorage positions could represent lost revenues of

Table 4.2.8-2 - Communities Within Commuting Distance of Pipeline Construction[a]

Pipeline Spread Region	Communities with Accommodations Within 20 miles of Pipeline	Overnight Rooms	Recreational Vehicles		Communities with Accommodations Within 20-60 miles of Pipeline	Overnight Rooms	Recreational Vehicles	
			Sites	Parks			Sites	Parks
3	Banning	54	98	-	Hemet	106	2,839	5
	Desert Hot Springs	222	225	-	Salton City	-	335	1
	Palm Springs	3,910	187	-	Yucca Valley	91	-	-
	Palm Desert	484	18	-	Twentynine Palms	62	532	8
	Rancho Mirage	456	-	-	-	-	-	-
	Indian Wells	224	-	-	-	-	-	-
	La Quinta	230	-	-	-	-	-	-
	Indio	361	541	3	-	-	-	-
	Blythe	448	2,081	25	-	-	-	-
4	Blythe	488	2,081	25	Parker	41	98	1
	Ehrenberg	40	0	0	Chandler	211	NA	NA
	Quartzsite	30	4-5,000	NA	Phoenix Area	11,414	552	3
	Gila Bend	130	NA	NA	-	-	-	-
	Goodyear	238	NA	NA	Tempe/Mesa	2,123	6,307	9
	Litchfield Park	224	NA	NA	Scottsdale	5,389	0	0
	Glendale	82	NA	NA	Apache Junction	126	2,089	4
	Casa Grande	363	62	15	-	-	-	-
	Coolidge	37	NA	NA	-	-	-	-
5	Coolidge	37	NA	NA	Tucson	7,490	2,540	NA
	Florence	21	867	1	Benson	50	23	4
	Eloy	435	209	5	Kearney	45	NA	NA
	Orade	12	NA	NA	Safford	108	24	NA
	Mamouth	15	NA	NA	-	-	-	-
	Winkleman	NA	6	1	-	-	-	-
	Hayden	15	NA	NA	-	-	-	-
	Willcox	324	NA	6	-	-	-	-
	Lordsburg	300	70	4	Silver City	336	NA	1
	Deming	570	394	11	-	-	-	-
	Las Cruces	1,463	NA	3	-	-	-	-
	El Paso	5,624	534	13	-	-	-	-
6	El Paso	5,624	534	13	-	-	-	-
	Kermit	120	12	1	Sierra Blanco	76	2	-
	Monahans	197	25	1	Van Horn	500	17	7
	Pecos	258	-	-	Fort Stockton	715	50	6
	Odessa/Midland	3,102	145	2	Carlsbad	1,230	NA	5
	Whites City	131	-	-	-	-	-	-

NA = not available.

[a]Number of overnight accommodations, recreational vehicle sites, and parks are best estimates from available information sources such as the American Automobile Association's Tour Book and Camp Book publications and from telephone conversations with local Chambers of Commerce.

Note: Accommodations are not shown for the POLA-Banning spread because of large-scale availability of all types of housing.

Source: BLM, 1984a, p. 4-61; ES, 1985.

Table 4.2.8-3 - Pactex Pipeline Contribution to County Tax Base

State/County	Approximate Length of Line (miles)	Assessed Valuation of Pipeline: Estimated Taxable (000$)	Assessed Valuation of Pipeline: 1984 Total Countywide (000$)	Assessed Valuation of Pipeline: Percentage of Total Countywide (%)	1984 Countywide Tax Receipts (000$)
California[a]					
Los Angeles	36	500,000	243,389,882	0.2	2,403,430
San Bernardino	42	77,000	28,341,459	0.3	294,889
Riverside	150	156,000	26,425,188	5.9	260,147
Arizona					
La Paz/Yuma[b]	72	29,300	267,153[c]	11.0	4,028
Maricopa	81	32,500	5,257,522	0.6	415,214
Pinal	106	36,900	305,816	12.1	39,294
Pima	10	3,500	1,777,879	0.2	196,084
Cochise	88	34,900	259,329	13.5	22,067
New Mexico					
Hidalgo	34	2,400	80,849	3.0	1,232
Grant	18	500	245,239	0.2	4,677
Luna	60	900	96,407	0.9	1,632
Dona Ana	42	1,800	411,363	0.4	9,133
Eddy	32	2,000	703,425	0.3	9,179
Lea	40	2,100	1,459,414	0.1	21,899
Texas					
El Paso	42	21,000	8,214,075	0.3	18,972
Hudspeth	62	24,200	170,552	14.2	255
Culberson	52	20,200	314,059	6.4	1,038
Winkler	16	6,200	1,169,593	0.5	3,859
Ector	32	12,400	5,797,355	0.2	15,073
Midland	16	28,200	5,072,591	0.6	7,147

[a]California has recently begun to levy a ROW tax; the estimated valuation corresponding to this tax is not included.
[b]La Paz County did not incorporate until January 1983. Assessed valuation and tax receipt figures are for 1983.
[c]Arizona operates under two distinct valuation bases for levying ad valorem property taxes: limited property value and full cash value. Limited property values are shown.
Source: ES, 1985.

$25,000 annually. A further ramification could be felt by ship bunkering companies, towboat operators, and others. One such ship bunkering company (Pacific Towboat Company) indicated that there has been a decline in bunkering traffic over the past several years and a surplus of unused anchorage positions. The possibility exists that the POLA anchorage area could be reconfigured or redesigned to obtain additional positions or that additional anchorage positions could be made available in the Long Beach harbor. Overall, the possible economic consequences of loss/relocation of four to five bunkering positions would not be a significant impact.

C. Economic Impact

The total estimated cost of the Pactex pipeline is $1.660 billion. Preliminary cost-breakdown estimates indicate that approximately 33% of direct project costs, or $548 million, will be allocated to labor, while 67% or $1.112 billion will be expended on materials and supplies.

Weekly construction payroll (including overtime) could peak at $3.8 million, of which 37% or $1.406 million, could be spent locally. Assuming a multiplier of 1.5 as representative for the Pactex project as a whole, the effect of local expenditures would be $3.5 million per week during peak construction activity. The total construction labor force is estimated at 3,000 workers. Short-term secondary employment is estimated at 800 to 1,000 jobs. The permanent Pactex employment of 162 persons, plus 40 contractor pipeline maintenance employees, could generate an estimated 100 to 125 secondary jobs.

D. Summary

During construction, a short-term adverse impact would occur in housing availability along selected sparsely populated segments of the pipeline, namely between Indio and Blythe, California, and between El Paso and Pine Springs, Texas. Short-term population and employment increases would occur in the lesser populated counties of New Mexico and Texas.

For the operational phase, no long-term significant impact would be experienced from changes in area population, employment, housing, or from demands on public services and facilities.

4.2.9 LAND USE AND RECREATION

This subsection identifies the potential impacts of the proposed project to current land usage and recreational facilities, and it assesses the project's compatibility with regulations, plans, and future land uses. Tables 3.2.9-1 and 3.2.9-3 list the land-use types crossed by the proposed pipeline corridor.

A. Construction

1. POLA to Blythe. Impacts on urban areas can be expected as a direct result of the construction phase. These impacts would result from localized traffic congestion caused by construction, by supply and personnel vehicle movements, and by increased construction noise, dust, and other nuisances. These impacts would be of a minor inconvenience and would last for the duration of the construction activities in any one urban location. No long-term land-use effects would be experienced.

There is no anticipated interruption of the public utilities servicing these urban areas. Major adverse impacts relating to utility networks would occur if an existing utility conduit were broken (e.g., gas, electricity, or telephone). This impact would most likely occur during construction activities. The severity would depend on the type of utility that was damaged and the duration that it remained out of service.

Construction through lands with existing agricultural/cultivated uses would result in a short-term impact involving the loss of any crops along the construction corridor during the construction period. After construction is completed, the pipeline route would return to the original use although overall productivity might be reduced for a few years, depending on the trenching method and the condition of the soil.

Construction through open space or open grazing lands is not expected to cause significant impacts because both existing vegetation and rural development are sparse. The short-term impact is expected to result from the loss of any grazing during the construction period and several years thereafter. After completion of the construction phase, the ROW would be restored and maintained in a cleared condition, and all nonagricultural development would be limited to safe and predetermined distances.

The major impact of the proposed project to existing land use in POLA would stem from the construction and placement of the landfill island. If constructed, the island would be the only permanent land base in the outer harbor area. The landfill island would house tanker berthing and offloading facilities along with a tank farm for petroleum liquid bulk storage. The area that would be affected by the island would be comprised of 115 acres of landfill, 68 acres of beach face, and 25 acres of dike. The island footprint would result in the loss of at least 115 acres of navigable waters. The proposed placement of the island would also eliminate four to five established deepwater anchorages. (Impacts to transportation are addressed in subsection 4.2.10.)

No adverse impact to land use in the port from the submerged pipeline system would be anticipated. Construction of the pipeline would be accomplished with conventional marine construction equipment and techniques (subsection 2.2.2). During the construction phase, increased congestion along the pipeline route would occur but this would last only for the duration of the construction activities. Once constructed, the submerged pipeline would not affect current utilization of the harbor area. A construction staging area of up to 40 acres would be located on the 190-acre landfill site on Terminal Island. The staging area would remove this land from its current usage for the duration of construction but no adverse impact to land use would occur.

The initial portion of the pipeline route in Los Angeles County would traverse an area of intense urbanization. The pipeline would follow the Dominguez Channel and the flood control channels of the Los Angeles River and the Rio Hondo for approximately 35 miles. Property within this corridor is public, and the buried line would not affect land use for the channel. The use of existing flood control channels would minimize the anticipated impacts of construction on urban areas.

The impact on land use from the development of pump stations would be a result of removing these sites from their present land-use pattern for the life of the project (5.5 acres for each station). Two of these sites (Rialto and Blythe) are presently located on open space land. The site proposed for the Wilmington station is located within an industrial area buffered by other activities relating to storage and industry.

Construction of the outer harbor landfill terminal would effectively reduce the water surface acreage available in POLA for recreational boating. This loss would be a long-term impact. Tanker movements to and from the landfill island would not significantly increase traffic in the port (an estimated increase of one tanker per day for the proposed project). Therefore, possible conflicts between tankers and smaller recreational boats would not be expected to occur. Impacts to recreational fishing as a result of increased turbidity from the dredge and fill operation might result in minor, short-term disruptions; however, the impacts would be negligible after turbidity decreases and fish populations again stabilize.

Potential impacts on recreational uses in California resulting from the construction of the proposed pipeline would be of short duration caused by the noise, dust, and other nuisances that would increase during the construction period for any one segment. For the numerous neighborhood parks and recreational areas in the communities surrounding the proposed pipeline corridor, minor, short-term disruptions such as noise and dust may affect the use of these areas. Encroachment of these facilities is not anticipated. Safety would be maintained by adequate security precautions and monitoring, as well as by the use of fences, flashers, caution signs, and other warning devices. Danger to children playing is not expected to increase the above local norm.

The proposed route would traverse flood control basins for a distance of approximately 35 miles. Construction would result in a short-term interruption of the recreational and equestrian activities. Minimal impact is

anticipated. Recreational activities could resume as soon as the construction through the area is completed and the area is restored to its original condition.

Pipeline construction in San Timoteo Canyon would create noise, dust, and truck traffic that would be a source of irritation for sightseers on county roads and recreationists using small private recreational developments. The proposed pipeline would not significantly alter recreational use of the California desert. The pipeline would be routed along an existing utility corridor, and it would not traverse any recreationally sensitive areas. Land along this segment of the proposed route is classified as open space. Construction is not expected to cause significant impacts because both existing vegetation and rural developments are sparse. Motorized recreational vehicles are a popular recreational activity in the California desert. The proposed pipeline corridor would pass through motorized vehicle areas with designated use "limited to approved routes of travel" and "limited to existing routes" as defined in CDCA Plan (BLM, 1980, pp. 87-88). Impacts to motorized vehicle recreational use would be limited to access disruptions during construction.

Recreational uses of the Colorado River are boating, skiing, fishing, and swimming. During construction of the river crossing, these activites may be curtailed temporarily because of an interruption of through-traffic on the river and a somewhat increased turbidity downstream. The construction schedule would be coordinated with appropriate controlling agencies, and is expected to last approximately 6 weeks. Recreational activities may resume almost immediately after completion of construction as the turbidity levels decrease to normal.

The proposed project would be consistent with identified land-use regulations and plans; see Table 3.2.9-4 (Stark, 1985; Brinkerhoff, 1985). Land-use policies applicable to the project are consistent throughout the urbanized areas along the route. Most jurisdictions view utility corridors as necessary elements in the urban infrastructure and have accommodated them. In rural areas, land designated for open space, recreation, agriculture, or open grazing utilization are interlaced, for most of the route, with a variety of existing utility corridors (i.e., transmission lines, rail lines, natural gas pipelines, etc.). Whenever possible, the proposed pipeline route uses existing utility corridors.

Development of land in POLA as proposed in the Pactex project would require an amendment to the Port Master Plan. Any amendment to the plan must obtain the same certification and approval as a Port Master Plan under the provisions of the California Coastal Act, 1976.

In California, developers of residential and other projects are able to file SDPs with county planning departments that depict the design and layout of their developments. An SDP has a legal status similar to a county master plan; therefore, the project must also be consistent with the regulations and plans identified in the SDPs. One SDP would be traversed in San Bernardino County; therefore, a review of the proposed project and the SDP may be necessary by the San Bernardino County Planning Office.

Within San Bernardino County, the JUMP imposes both siting and design criteria and a siting and approval process. Of primary concern in JUMP is that "new pipeline corridors should be consolidated with existing pipeline or electric transmission line corridors except where there are social, aesthetic, significant economic, or other overriding concerns." The Pactex ROWs would generally parallel existing roads, railroads, and pipelines in the county; therefore, it is consistent with the intent of JUMP. However, final approval of the ROW would be required from the county.

The BLM California Desert Conservation Area Plan (BLM, 1980) lists approved utility corridors for pipelines and electric transmission lines. The proposed Pactex pipeline would traverse this area in an established utility corridor (K corridor) and is consistent with the provisions of the plan.

2. Blythe to Pine Springs. The impact of construction activities on land use along the pipeline route east of Blythe would be temporary and of a short duration. The greatest potential for adverse impacts from pipeline construction would be in areas with agricultural, residential, and recreational land uses. Within the affected counties, disturbance to irrigated cropland would be approximately 715 acres (based on a 100-ft construction corridor width). Although the disruption to farming activities would be considered short term, lasting during construction, it may result in delays in some planting or harvesting, depending on the time of construction and field layout.

Rangeland would be the dominant land use crossed by the pipeline, making up 72% of disturbance. Temporary gates and other measures would be erected to prevent livestock from escaping. Grazing land affected during construction would represent a very small percentage of available land; after restoration is complete, grazing would again be possible.

Areas of concentrated residential use would be limited to Lordsburg and Deming, New Mexico. Other segments of the route are open space land or have only scattered residences. Impacts to these areas would be minor inconveniences and would last only for the duration of the construction activities. No long-term land-use effects would be experienced. Construction of a new ROW corridor could have potentially long-term effects on urban growth patterns. Because the Pactex pipeline would parallel existing pipelines, it would not create any new ROWs going through or adjacent to any urbanized areas. No significant long-term impact to urban growth patterns would occur.

Impacts on the pump stations of La Posa, Gila, Coolidge, Redington, Lordsburg, Akela, and Hueco would result in the removal of this land (approximately 38.5 acres) from its current use pattern. Land-use impacts of the operation of these facilities would be minor but long term.

Impacts to recreational areas along this segment of the pipeline would be minor and of a short duration. Increased noise and dust from construction would result in inconveniences to recreationists but these disturbances would be temporary.

The proposed project would generally be with identified land-use regulations and plans (Table 3.2.9-4). The proposed pipeline would be adjacent to an existing El Paso Natural Gas Company pipeline through Fort Bliss Military Reservation in Texas. After a required cultural resources survey of the ROW and other stipulations have been completed, the proposed project would be consistent with U.S. Army requirements (BLM, 1984a p. 4-82).

3. Pine Springs to Midland. The remaining section of pipeline from Pine Springs to Midland would cross predominantly open space grazing land. Impacts of construction activities would be temporary, and no long-range effects on land use are expected. Agricultural land traversed by the pipeline would be limited (Table 3.2.9-1). Disruption would occur to cropland during the construction phase, but this would normally impact cropland for one harvest period.

Development in this area is sparse: any impact to urban lands would primarily occur at Midland. Pipeline construction would not effectively cause a disturbance of current land use. The 100-acre terminal site in Midland would involve an impact of construction on land use; however, the proposed site is in an area previously used as a petroleum tank farm site. Impacts on land use from the development of the Midland terminal would be minor but long term.

Impacts to recreational areas along this segment of the pipeline would be minor and of short duration. Increased noise and dust from construction would result in an inconvenience to recreationists, but this type of disturbance would be temporary.

The proposed project would be consistent with identified land-use regulations and plans (Table 3.2.9-4) (Dawson, 1985; Faris, 1985; Harrad, 1985; Stockwell, 1985; Tschauner, 1985; Williams, 1985).

B. Operation

The normal O&M of the proposed pipeline system and accompanying pump stations is not anticipated to result in any major impact on land use and recreation.

After construction is completed, operation of the pipeline would produce minimal impacts to current and future land use. The pipeline corridor would be maintained and subject to periodic inspections. If repairs should be necessary, maintenance procedures would result in localized short-term impacts, similar to but less than those generated by construction of the proposed project. Operation of the pump stations would result in minor but long-term impacts to land use. Normal O&M of the proposed pipeline is not anticipated to result in any significant impact on existing recreational areas with the possible exception of an accidental oil spill. In the remote event of a major oil spill, all water-oriented recreation in the harbor would be temporarily halted until containment and cleanup operations were completed. Fisheries would be severely reduced in abundance temporarily until this renewable resource is recovered, and recreational boating would be curtailed temporarily. A major maintenance problem would result if a spill should enter a small craft marina area. Swimming and other water sports would have to be abandoned until cleanup activities were completed.

In the event of a pipeline leak, the Colorado River downstream from the crossing to Imperial Dam might be impacted with an oil slick. Such a leak (e.g., oil slick, depending on its magnitude) might render the river and its associated lakes unfit for recreation, especially swimming and waterskiing, until cleanup was effected. The leak could also kill some fish and waterfowl, reducing fishing and hunting opportunities. Although a pipeline rupture is a remote possibility, the potential impacts from a major oil spill on the Colorado River would be disastrous for recreational resources.

Oil spillage at the Gila River and Rio Hondo crossings would also adversely affect fishing and waterfowl hunting. A pipeline leak or rupture at the Pecos River crossing could spread over the Red Bluff Reservoir before containment and cleanup. Oil on the reservoir would preclude boating, fishing, waterskiing, and swimming at this popular recreational area for an indeterminable period until cleanup could be completed.

C. Summary

Although some adjacent land uses along the proposed route will be affected by noise, dust, etc., these impacts would be temporary, and there would be no long-term effect from pipeline construction. Construction through the lands with agricultural/cultivated uses would result in a short-term impact involving the loss of utilization of these lands. The level of impact on the urban areas would be minor, considering the potential secondary uses of the route such as open space, greenbelt areas, recreation buffers, or utility corridors.

Approximately 276 acres of land would be needed for pumping stations and terminal storage facilities. Operation of these facilities would constitute a long-term impact to current and future land use. The potential impacts on recreational uses would be of a short duration caused by increased noise, dust, etc., during construction. The major potential effect on land use would be the accidental oil spillage from a pipeline leak or rupture. Water-related recreation would be significantly impacted by a major oil spill in POLA or on the Colorado River. Operation and maintenance of the pipeline system would result in minor, short-term impacts involving ROW maintenance and pipeline safety checks.

4.2.10 TRANSPORTATION, ENERGY, UTILITIES, AND PUBLIC SERVICES

A. Transportation

Transportation impacts associated with the proposed Pactex pipeline relate primarily to factors such as increased traffic activity levels and increased congestion, delays, or average travel time.

1. Impacts to Surface Transportation.

a. Construction Phase. The proposed pipeline route from the POLA to Midland, Texas, would cross 65 state and Federal roadways and numerous minor roadways (both public and private) throughout the states of California, Arizona, New Mexico, and Texas. The crossing of these roadways would be undertaken by boring and installing the pipeline underneath the road ROW. As a general rule, traffic flow on these roadways would not be interrupted. Construction activities may occur within the road ROW but are planned to not interrupt the flow of the roadway itself. However, some disruption to traffic in the general POLA area will likely occur when heavy equipment enters and leaves the Pactex construction staging area on Terminal Island. No state or Federal roadway would be subject to interruption of traffic flow or traffic control for more than several hours at a time if such should occur.

Some roads may require control of a minimal amount of traffic (i.e., proper signing, barriers, or flagmen); however, temporary access across or around roadways where service would be interrupted would be provided. Some congestion in these areas of temporary disruption would last for 1 or 2 days. Emergency access would be provided under these conditions. Slow-moving heavy construction equipment would be moved to the ROW via major highways along the pipeline route. After the pipeline ROW is accessed, the construction equipment would be restricted to movement along the pipeline ROW; thereafter, the only potential for interruption of traffic flow along the pipeline ROW would occur at highway crossings as the equipment moves from one side of the roadway to the other. During the movement of the heavy equipment on and over highways, some congestion would occur. This would result from the need to stop traffic to allow for the crossing of heavy equipment, as well as the need to reduce traffic speeds of cars following the heavy equipment along the roadways. Precautions including flashing lights, flagmen, and signing would be taken to ensure that safe operations within the highway ROW would occur. These interruptions would occur infrequently and would be of a short duration (several hours) (BLM, 1984a, p. 4-84).

During the construction phase, workers would need to access the pipeline ROW daily through the use of the local roadway network. The construction workers would travel by private automobile (assume one construction worker per vehicle) to the nearest access point to the construction area. Vehicles would be parked along the pipeline ROW away from public roadways. On an average day, a maximum of 515 construction workers would access the pipeline ROW via the nearest major roadway to the construction site, resulting in an estimated 515 auto movements typically generating trips of 10-40 miles. The

construction workers are expected to commute to the site during the hours from 5:30 a.m. to 6:00 a.m.; they would leave the site from 5:30 p.m. to 6:00 p.m. These times correspond typically to the beginning and end of the morning and evening peak hours in urban areas. During these hours, additional congestion on access roadways is expected to occur; however, this brief congestion in the morning and evening hours would take place on any single roadway for only an average 20-day period. At the end of this period, the spread would have moved to a point along the line close to another access road. Approximately one-third of the access points to the pipeline would occur on state and Federal roadways in populated areas such as in Los Angeles County, San Bernardino County, and the City of Midland. Any congestion caused by the addition of 515 more vehicles to the high capacity roadway systems in these areas would be of a short duration. In rural areas, the congestion would also be of short duration.

Railroad crossings would also be accomplished by the use of boring methods. Traffic flows would not be interrupted during construction. Train speeds would be reduced in the area of construction where heavy equipment may be crossing the railroad ROW. Precautions such as flashing lights and flagmen would ensure safe operations.

b. Operation Phase. The addition of 108 permanent Pactex operating personnel in the Los Angeles area and 21 permanent personnel at Midland would be of such small magnitude as to have no discernible impact on highway traffic flows.

2. Marine Transport Impact.

a. Construction Phase. There will be a noticeable increase in barge traffic during construction of the Pactex offloading facility. One dredge will be operating full time, while a second dredge will operate largely on a part-time basis. During the initial construction period, both dredges will be operating full time; however, neither dredge will operate in a shipping lane.

Two barges will be used to transport rock from Catalina Island to POLA. Each barge will make one round trip daily for a period of nearly 1 year. Two other barges will operate full time, transporting men and supplies to the construction site. Each barge will make five or more round trips daily. Two other barges will be engaged in the placement of pilings. These barges will be largely stationary, although each barge will make one round trip daily from shore to the point of construction activity. In summary, peak construction conditions will reflect two dredges in operation and six barges, generating 18 movements daily in the harbor. With advance notice to pilots and other operators using the port, commercial vessel traffic flow should remain unimpeded.

b. Operation Phase. Table 4.2.10-1 presents the projected annual tanker arrivals of vessels transporting crude oil to the Pactex terminal at the POLA. Vessels laden with oil may arrive from several sources; however, Alaska is expected to be the major source. Annual vessel arrivals to the offloading terminal would amount to 408, assuming the projected fleet mix submitted by Pactex in its application to POLA. This is equivalent to an average of 1.1 vessel arrivals daily. However, the use of larger tankers (made possible by the proposed increase in channel and berth depths to 75 ft, as shown under Case II in Table 4.2.10-1) would reduce annual arrivals to 294. Pactex-related tanker arrivals would amount to 5.8% of total existing vessel movement in San Pedro Bay, assuming 408 tanker arrivals or 4.2% assuming 294 tanker arrivals. The 408 arrival figure would represent a 36% increase in existing tanker traffic, while the 294 figure would increase such traffic by 26%.

Table 4.2.10-1 - Projected Annual POLA Tanker Movements - Pactex Pipeline Traffic

Fleet Mix (000 tons dwt)	Vessel Capacity (000 bbl)	Arrivals/ Year	Annual Cargo Volume (million bbl)
Case I			
80	534.7	159	89.9
120	843.4	160	134.9
165	1,165.2	89	103.8
114.2			
Total (average)	793.3	408	328.6
Case II			
120	843.4	116	98.6
165	1,165.2	89	103.8
190	1,330.0	45	59.8
209	1,463.0	22	32.2
225	1,575.0	22	34.6
158.8			
Total (average)	1,116.4	294	329.0

Source: Pactex, 1985.

Based on a USCG study that indicated that 41.5% of the daily Los Angeles/Long Beach traffic uses the Santa Barbara Channel, Pactex tanker traffic would increase Los Angeles/Long Beach-related traffic by 14%, assuming 408 annual arrivals, and by 10% assuming 294 annual arrivals. Although the percentages could appear significant, actual channel traffic would increase by approximately one vessel movement per day in each direction. Increased tanker traffic of one per day for the Pactex facility would not be considered an excessive increase of tanker traffic volume for the Santa Barbara Channel (USCG, 1985b).

The delivery of Alaskan crude oil to POLA will have some impact on the existing north/south tanker movement pattern off the southern California coast. Laden tankers engaged in the transport of Alaskan crude oil via the Panama Canal traverse sea lanes west of the Channel Islands. Delivery of Alaskan crude oil for offloading at POLA would divert much of the existing Alaska crude oil tanker traffic into the Santa Barbara Channel, thereby causing some change in existing tanker traffic patterns. The impact, however, is not as great as it would appear, because some tankers returning to Alaska in ballast now bunker in the Los Angeles-Long Beach Harbors. Annually, the ports of Los Angeles-Long Beach experience about 1,900 bunker arrivals (those engaged in Alaska crude oil traffic not separately identifiable). Bunkering services are particularly attractive here because vessels may easily and rapidly obtain these services, as opposed to much longer servicing times at San Francisco. The cost of fuel is also cheaper outside Alaska. The salient point is that some portion of the Alaskan crude oil tanker traffic is already using POLA and traveling through the Santa Barbara Channel.

With regard to the need for ship navigation safety equipment (as discussed in subsection 4.3.16), all ships transporting domestically produced crude oil must by law be U.S.-built and owned and operated by U.S. crews. Therefore, these vessels would be in full compliance with existing maritime safety laws and regulations and would be equipped with all necessary navigation safety devices.

Construction of the proposed landfill island will necessitate elimination of four to five anchorage positions in POLA. The impacted anchorages are depicted in Figure 4.2.10-1. Anchorage positions C-2, C-3, C-8, and C-9 would definitely be eliminated. The status of position C-7 is uncertain. Positions B-8 and C-4 are marginally affected. The elimination of four to five anchorage positions from their existing locations is not considered a significant impact.

3. Summary. During construction, traffic congestion (roadway, rail, and maritime) would be minor and of a short duration. Surface traffic delays would be minimal because all major highway and railroad crossings would be tunneled without cutting the travel surface. Equipment crossings would be monitored and controlled carefully. Access would be maintained on existing roads at all times during construction, thus maintaining emergency access throughout the development of the project. Maritime activity would also be closely monitored during construction.

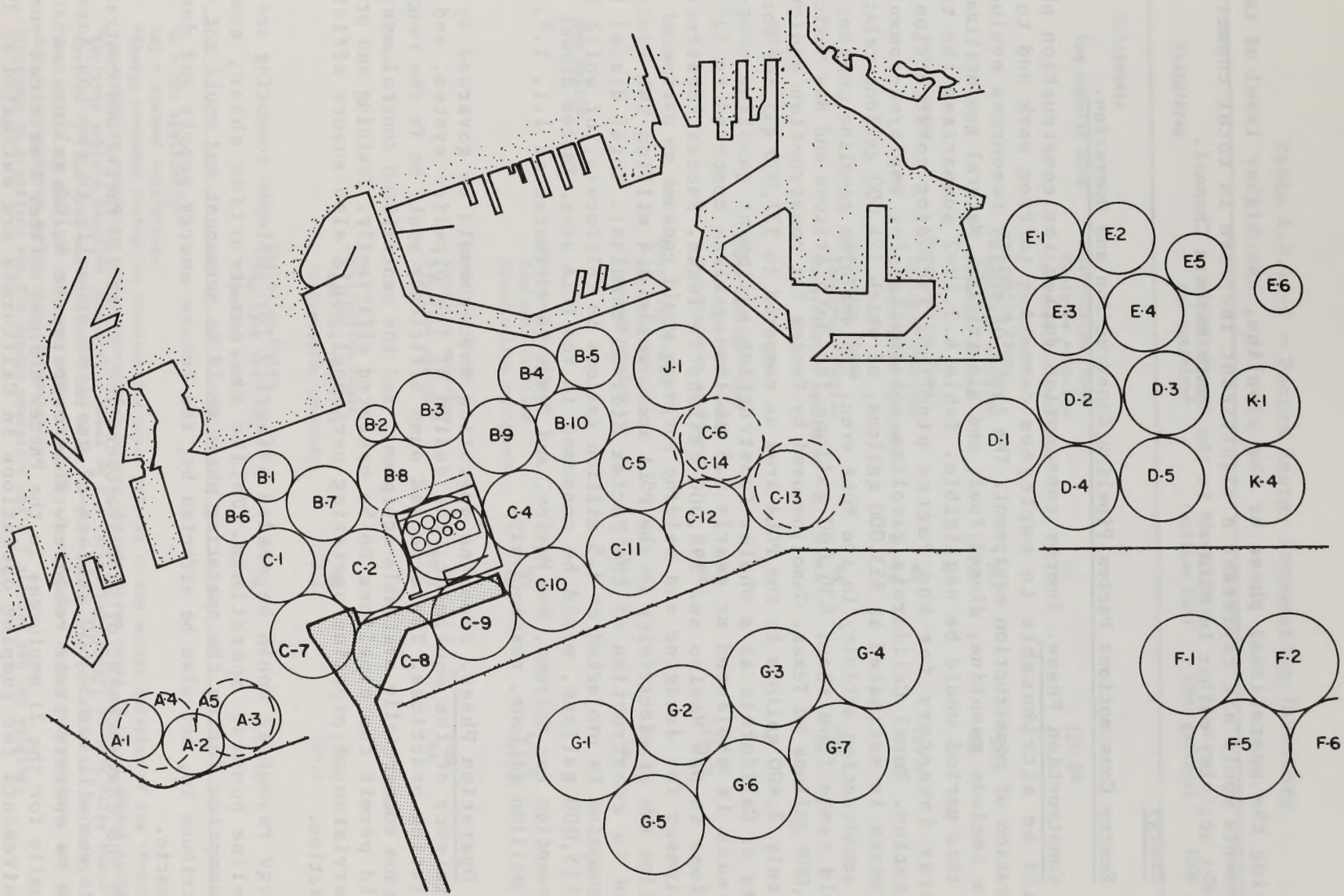


Figure 4.2.10-1 - Impact of the Pactex Project on Existing Anchorages in San Pedro Bay (LAHD, 1985; ES, 1985)

During the operational phase of the pipeline, the higher level of tanker movements would not represent a significant increase in total commercial vessel activity either in POLA or in the Santa Barbara Channel.

B. Energy

1. Energy Consumption: Pactex Pipeline Construction and Operation.

a. Construction Phase. Energy consumption during the construction phase would be attributable to employees commuting to/from work and to the operation of construction equipment. The types of energy resources evaluated here include gasoline, diesel fuel, and electricity. Natural gas utilization for this period would be negligible. Table 4.2.10-2 summarizes the total energy inventory for the Pactex pipeline, including construction and operation. Total California gasoline consumption for employee-commuting purposes is estimated at 853,000 gallons, of which 124,000 gallons relate to the construction activity in the POLA area. The employee gasoline consumption would range from about 430,000 gallons for both Arizona and New Mexico to 534,000 gallons in Texas. Gasoline used by Pactex for construction equipment is only 2,400 gallons in the POLA area as compared to 337,000 gallons for the state of California as a whole. Construction equipment gasoline usage in Arizona is projected at nearly 0.5 million gallons compared to 327,000 gallons in New Mexico and 298,000 gallons in Texas. Pactex construction equipment for dredging and welding purposes would consume an estimated 31.7 million kWh of electricity in the POLA area, while 0.4 million kWh would be used in construction of the Pactex Midland terminal. Total diesel fuel consumption is projected at 1.5 million gallons in California, of which 27%, or 415,000 gallons, would be consumed in the POLA area. Pactex diesel fuel consumption for Arizona, New Mexico, and Texas is estimated at 1.1, 1.7, and 1.2 million gallons, respectively.

b. Operation Phase. Pipeline operating energy would be governed by the efficiency of the equipment, the design of the pipeline system, and the operating practices. The expected pump efficiency would be in the range of optimum commercially available equipment, and the centralized control systems would permit the pipelines to be operated efficiently. Training and proper supervision of pipeline operating personnel would also ensure efficient operation.

Energy resources would be needed primarily for employee commuting and for pipeline pumping operations. Unlike the construction phase, energy consumption during the operating phase would be permanent and would not only contribute to, but also be affected by, the future energy supply and demand scenario.

With the commencement of pipeline operation, about 130 Pactex and contractor employees will use 37,600 gallons of gasoline annually in the Los Angeles area to operate their vehicles. This compares to 6,100 gallons consumed annually for the 21 employees in the Pactex Midland office. Electrical energy requirements for pumping operations in California are estimated at 359.4 million kWh/yr, of which 119.8 million kWh will be consumed at the pumping

Table 4.2.10-2 - Pactex Energy Consumption Inventory

State/Area	Project Phase and Activity[a]	Electricity (million kWh)	Gasoline (000 gallons)	Diesel (000 gallons)
California				
Los Angeles area	Construction Phase			
	Employee vehicles	NA	124.0[b]	NA
	Construction equipment	31.7[c]	2.4	415.0
	Operation Phase			
	Employee vehicles	NA	37.6	NA
	Pipeline system	119.8	NA	NA
Other areas	Construction Phase			
	Employee vehicles	NA	729.0	NA
	Construction equipment	neg	334.1	1,121.3
	Operation Phase			
	Employee vehicles	NA	neg	NA
	Construction equipment	239.6	NA	NA
Arizona				
	Construction Phase			
	Employee vehicles	NA	427.0	NA
	Construction equipment	NA	499.0	1,698.0
	Operation Phase			
	Employee vehicles	NA	neg	NA
	Pipeline system	479.2	NA	NA
New Mexico				
	Construction Phase			
	Employee vehicles	NA	429.0	NA
	Construction equipment	NA	327.0	1,119.0
	Operation Phase			
	Employee vehicles	NA	neg	NA
	Pipeline system	359.4	NA	NA
Texas				
	Construction Phase			
	Employee vehicles	NA	534.0	NA
	Construction equipment	0.4	298.0	1,175.0
	Operation Phase			
	Employee vehicles	NA	6,100.0	NA
	Pipeline system	119.8	NA	NA

NA = not applicable.
neg = assumed negligible.
[a]Energy consumed during the construction phase relates to the entire duration of the 18-month construction activity; energy consumption during the operation phase is on an annual basis.
[b]Employee vehicle gasoline consumption based on 1.2 carpooling factor; 20-mile daily round-trip for workers in POLA area and Midland, Texas area; 50-mile round-trip for all other workers; 15 miles for each gallon of gasoline consumed; 300 working days/year/worker during construction; and 260 working days/year/employee during pipeline operation.
[c]Includes 31.4 million kWh for dredge operation and 0.3 million kWh for welding.

Source: Pactex, 1985; ES, 1985.

station in the POLA area. The annual electric energy requirements for Arizona, New Mexico, and Texas are estimated at 479.2 million, 357.4 million, and 119.8 million kWh, respectively.

Operation of the Pactex pipeline would place an increased demand primarily on existing electrical energy sources. However, this should not substantially impact the regional supply and demand of energy sources. For example, electricity generated for the South Coast Air Basin is currently estimated at 3.5 billion kWh per year. The average annual power consumption projected for the Pactex pipeline is 120 million kWh. Electric energy requirements at other locations in California (and in other states as well) will not necessitate construction of additional generating capacity. The total gasoline usage is currently estimated at somewhat less than 10 million gpd for Los Angeles County. Fuel consumption from commuter vehicles during both the construction and operation phases of the Pactex pipeline would be negligible in comparison to total daily consumption for Los Angeles County. Finally, diesel fuel demand during construction of 415,000 gallons for the POLA area compares with current estimated diesel fuel demand in Los Angeles County of 32 to 35 million gallons per year, or somewhat more than 1%.

2. Energy Consumption: Pactex Pipeline versus Tanker. The following discussion focuses on the comparative energy requirements for the Pactex pipeline and tankers to transport 1 barrel of crude oil from Los Angeles to Midland, Texas.

Table 4.2.10-3 lists the estimated future energy consumption for a typical crude oil shipment using tanker transport from POLA to the gulf coast. This scenario assumes the use of a 165,000-dwt vessel for the Los Angeles-to-Panama route sector, offloading the cargo for transshipment through the Trans-Panama Pipeline, and loading the crude oil shipment back into a 90,000-dwt tanker. The 165,000-dwt vessel is too large to traverse the canal; hence, the need to transship by pipeline and then reload onto another tanker at the eastern terminus of the canal. Because many of the gulf coast destinations are river accessible with limited depths, a smaller sized vessel is required for the Panama-gulf coast route segment. The estimate of vessel energy requirements reflects round-trip fuel consumption.

Table 4.2.10-4 provides a summary of the Pactex operating energy requirements for the entire pipeline routing. The salient finding is that the pipeline would consume 44,100 Btus for each barrel of oil transported. Table 4.2.10-5 presents an estimated operating energy consumption comparison between the transport analysis previously presented and the proposed pipeline. The energy required for transporting crude oil from POLA to the gulf coast by pipeline would be about 70% of that required for ship transportation. With crude available in sufficient quantity to utilize the proposed pipeline, this would constitute an energy-effective transport method and could save up to 2,700 barrels of residual fuel daily that would otherwise be used for marine transport purposes.

Table 4.2.10-3 - POLA to Gulf Coast: Estimated Future Energy Requirements for Typical Round Trip

Use	Btu/Round Trip (million)	Btu/bbl	Total (%)
Propulsion	99,225	55,870	88.7
Hoteling (e.g.)[a] pumping	12,600	7,100	11.3
Total	111,825	62,970	100.0

[a]Includes energy requirements for Trans-Panama Pipeline.
Note: Estimated cargo capacities: 52,000 dwt: 327,000 barrels
90,000 dwt: 611,000 barrels
165,000 dwt: 1,165,000 barrels
Source: Pactex, 1985.

Table 4.2.10-4 - Los Angeles to Midland: Estimated Pactex Pipeline Operating Energy Based on Full Load Operation

Item	Factor
bpd	900,000
Pumping power	
Average hp	181,470
Average kW[a]	150,418
kWh/bbl	4.01
Total primary energy[b]	
Million Btu/hr	1,654.6
Btu/bbl	44,100

[a]Average kilowatts based on 90% electric-line to motor-shaft efficiency.
[b]Total primary energy is based on total fuel expended for power. Assumed power generation heat rate for central generating station: 11,000 Btu/kWh.
Source: Pactex, 1985.

Table 4.2.10-5 - Comparison of Estimated Operating Energy Consumption (1,000 Btu/bbl)

Item	Consumption
Pipeline	44.100
Tankers	
Propulsion	55.900
Hotel, pumping, and emission control system	7.100
Total	63.000

Note: Estimated energy of the proposed pipelines averages 70% of tanker energy.
Source: Pactex, 1985.

The above analysis reflects one of several possible tanker versus pipeline energy comparison scenarios. The analysis presented here focuses on the use of 165,000-dwt tankers transporting crude oil to Panama. It is possible that larger, newer, and more energy efficient vessels could be placed in operation. Therefore, although the conclusions of this analysis, which are supported by a similar study (BLM, 1984a, p. 2-63), indicate a substantial energy savings from the Pactex pipeline operation, the magnitude of energy savings will be subject to variation. Even if the actual realized savings are less than those projected in this analysis, the savings should still be substantial. It can be reasonably concluded that the proposed Pactex pipeline would save 500,000 to 1 million barrels of fuel oil annually that would otherwise be used for marine transport of the crude oil from the U.S. west coast to the gulf coast.

3. Measures to Reduce Energy Consumption. Measures that would reduce energy consumption during construction and operation of the proposed Pactex project include the following:

(1) Implementation of the most efficient project schedule, design, and equipment to avoid energy waste.

(2) Use of shuttle buses or carpooling to transport construction workers from selected staging points to the work area.

(3) Use of carpooling by permanent operating employees.

(4) The Pactex project itself would reduce energy consumption as described in the above analysis.

4. Summary. The proposed Pactex project would represent an insignificant percentage of Los Angeles' energy requirements. A similar statement would also apply to energy requirements along all other sectors of the pipeline system.

Operation of the pipeline would likely result in substantial energy savings compared to tanker transport.

C. Utilities

1. Electric Power.

a. Construction Phase. An estimated 31.4 megawatt-hours of electric power would be required for dredging operations during construction. Power to the 9,000-hp dredge would be provided by a submerged line from the mainland to the dredge. The submerged line would be provided by the dredge owner and would hook up with a metered switchboard in a substation installed by the Los Angeles Department of Water and Power (DWP) especially for the dredging operation. (The substation would be located where most feasibly convenient for the dredge operation.) The Los Angeles DWP is of the opinion that the power supply will be readily available (Delarosa, 1985). One to two 34.5-kV lines would be used to supply power to the substation.

b. Operation Phase. The electrical requirements for the 20,000-hp pump at the Wilmington pump station is part of the total load growth forecast for the City of Los Angeles (Delarosa, 1985). Power to the Wilmington pump station would be provided through a new substation to be installed by the DWP at a location mutually agreeable to the DWP and Pactex. Such a substation is considered a large installation by the DWP and could cover an area as large as 60 ft by 60 ft. As many as three 34.5-kV lines may be needed to supply power to the station (Delarosa, 1985). The line from the metered switchboard at the substation to the pumping station would be provided by Pactex.

Power to operate the 2,000-hp pump on the landfill island may be provided either by Pactex or by a submerged line to the mainland connecting to the Los Angeles DWP system.

Southern California Edison (SCE) would provide power to the 20,000-hp pumping station at Rialto and the 16,000-hp pumping station at Blythe. Power would be supplied from either existing substations (if available capacity exists) or from newly installed substations. The power requirements to operate the two pump stations (approximately 35 MW) will have an insignificant impact on the SCE's system capacity of 15,000 MW (Gardner, 1985).

For the Rialto and Blythe pump stations, SCE would provide power using a single wood pole extension from an existing line or from an existing substation. For Blythe, a 33-kV line hookup is most probable. For Rialto, the hookup could range from a 33-115-kV line (Gardner, 1985).

SCE would build a small substation facility containing switchgear, meters, etc. Either SCE or Pactex could own and operate the substation. The modest-sized substations would measure 15 ft by 30 ft and would have no environmental impact as far as SCE is concerned.

2. Water. Provision of potable water during construction would be insignificant and would be provided by Pactex.

The requirements for potable water during pipeline operation would be primarily dictated by the needs of the operating staff at the landfill island and the Wilmington pumping station. Both facilities would employ approximately 25 persons. The island potable water requirements would be provided by Pactex. (Seawater would be used for fire suppression.) The needs of the operating personnel at the Wilmington station would have negligible impact on the local water system (Sakai, 1985).

3. Sanitary Sewer. There is no sanitary sewer service to the Wilmington bulk storage area. The existing 18-in. sanitary sewer system in that vicinity terminates on the west side of the Dominguez Channel at Anaheim and Preble Streets in Wilmington. This line feeds into the Terminal Island Treatment Plant.

A proposed new pump station and force main are presently being considered at I Street, west of the Terminal Island Freeway, about 1 block east of Henry Ford Avenue. There is no schedule for construction of the project.

Pactex would be responsible for disposal of sanitary waste both at the Wilmington site and at the landfill island during the construction and operation phases. Daily sanitary waste during operations is estimated at less than 2,000 gallons at each location (25 employees per location x 75 gallons per capita).

Because sanitary sewer service is not available to either the Wilmington pump station or the landfill island, there would be no impact from the Pactex project on the existing sanitary sewer system.

4. Telephone. Pacific Bell would provide service to both the landfill island and the Wilmington pump station. Service to the island would be provided via submarine cable. Pactex requirements would have an insignificant impact on the existing telephone system.

5. Storm Drains. The Wilmington site does not have a storm sewer system. The closest storm sewer is only a 27-in. line and empties into the Dominguez Channel at I Street. This line is too small to accommodate existing needs adequately. A new storm sewer is proposed along Anaheim Street between the channel and the Terminal Island Freeway. Construction has not been scheduled; therefore, Pactex would be responsible for stormwater removal at both the Wilmington and landfill island sites during construction and operation of the pipeline systems. There would be no impact on the existing storm sewer system.

6. Solid Waste. There are no landfills in the vicinity of the harbor areas for disposal of solid waste; however, there are a number of privately operated transfer stations in the area. Collected solid waste refuse is transported by truck from the transfer station to distant landfills. The two city-owned and -operated landfills are not open to the public. Available landfills include the county-owned and -operated Sholl landfill near Eagle

Rock, California, and privately operated landfills such as Bradley west landfill in Sun Valley and the Sunshine Canyon landfill in the San Fernando Valley. These landfills accommodate both organic waste (e.g., residential solid waste) as well as inert material such as wood and concrete. There is no hazardous waste dump within 150 miles of Los Angeles.

Pactex would be responsible for solid waste disposal on the landfill island. Waste at the Wilmington facility would be disposed of by a commercial refuse collection service and would have an insignificant impact on existing landfill capacity.

7. Summary. For both the construction and operation phases, the proposed Pactex project would have no significant impact on existing utility networks, including electric power, water, sanitary sewer, public services, and solid waste. There would be no demand for natural gas.

D. Public Services

1. Police/Security. Construction activities should not result in a significant impact on the LAHD Port Warden Division (or on any other police jurisdiction along the pipeline route). Some additional surveillance by patrol boats in POLA may be required temporarily to minimize potential conflicts between vessels and floating construction equipment during construction of the landfill island.

Because of the remote location of the island, security problems are expected to be minimal during operation of the facility. Surveillance and security will be provided as part of existing routine patrols. Operation of the Wilmington pump station would require additional patrols by the Port Wardens. However, security problems at this facility are also not anticipated, and additional Port Warden personnel should not be required. Engineering design of both facilities would include a security system consisting of lighting and fencing; operating procedures would be developed to maximize security of the facility.

2. Fire Protection. The Los Angeles Fire Department (LAFD) requires that adequate access, egress, water supply/flow, fire hydrants, and other protection systems be installed and maintained for both the landfill island and the Wilmington pump station. These project components would be constructed and operated in conformance with applicable provisions of the Los Angeles City Municipal Code.

Definitive engineering design and specifications for the terminal, including the fire protection system, have not been developed. When this information is developed, it would be submitted to the LAFD, and all necessary permits and approvals from the LAFD would be obtained prior to project commencement.

Proximity of the two facilities in the port area to existing fire stations would dictate some aspects of the engineering design. The closest engine company to the Wilmington facility is Fire Station 38, located approximately 2 miles away, while the nearest fire boat station to the island (Fire Station 110, Berth 43) is located approximately 1.5 miles distant.

While the above discussion focuses on the Los Angeles area, it is not anticipated that additional fire department personnel or equipment would be required at any point on the system. Future discussions between Pactex and fire department personnel would resolve this issue as project requirements become more definitized.

3. Coast Guard. Minor impacts to the USCG would result from project implementation. These impacts would fall on the Marine Safety Office, which would provide vessel inspections for the increased tanker traffic using the port, as well as pollution monitoring and vessel safety. In addition, the USCG would be involved in the permitting process where the pipeline traverses river crossings, as well as disseminating a "notice to mariners" regarding the submerged pipeline from the island to the mainland.

The USCG, i.e., the Captain of the Port of Los Angeles, must also approve the vessel offloading operating manual to be prepared by Pactex at least 60 days prior to operation. The USCG is responsible for regulating anchorages, and the landfill island proposed for the project would affect approximately five existing anchorages. Sufficient anchorages are available in San Pedro Bay, and the loss of several anchorages would not create a significant impact. The USCG may have to redesignate other anchorages for expanded uses to compensate for any losses. The need for additional USCG services is not anticipated to be significant.

4. Summary. The proposed Pactex project would generate little, if any, demand for additional police, fire, and USCG services.

4.2.11 CULTURAL RESOURCES

Impact assessment procedures for cultural resources and regulatory compliance were described in the All-American EIR/EIS report and supporting technical reports for the All-American project and the Pactex project (see subsection 3.2.11 for references). Impacts were assessed on the basis of existing information and overviews. Application of criteria for evaluating significant cultural resources and impacts from the Pactex project focuses largely on sites listed in or eligible for listing on the National Register of Historic Places (NRHP) and similar registers for regional, state, and local resources and on those sites that are expected to meet the same criteria.

The corridor described in subsection 3.2 includes a 1-mile-wide zone, 0.5 mile on either side of the ROW. In the impact analyses that follow, impacts on cultural resources are described only for those known or potential resources within the construction ROW areas, 100 ft on either side of the centerline. Resources in the corridor indicate the sensitivity of the general area and the potential resources in the less throughly surveyed segments of the ROW where no sites are known. In the event that changes of the centerline occur, as with the recent realignment in West Texas, indentified impacts and their significance would have to be reevaluated prior to construction.

A. POLA

The limited cultural resources in the construction areas and along onshore pipeline in POLA reduce any significant impact on known or potential resources. No historic surface structure lies within 100 ft of the dredging or filling areas or within 100 ft of the shoreward and onshore pipeline ROW in POLA. Therefore, no adverse effect would be produced on recorded surface structures. Three shipwreck sites have been identified in the dredging and filling areas. Some adverse effects may arise if any submerged resource is determined to be eligible for NRHP.

B. California

Within California, 17 cultural sites lie in or immediately adjacent to the 100-ft construction ROW out of 69 in the corridor. Of these 17 sites, 1 site has been listed on the NRHP, while 9 others are considered to be potentially eligible. Damaged portions of 3 village sites and an Indian cemetary may extend into the ROW, but insufficient data precludes a determination of integrity and significance. If parts of these sites remain intact, they may be eligible for the NRHP.

Four of the 17 sites lie on Federal lands in the ROW, while the remaining 13 in the ROW lie on private lands (Table 4.2.11-1).

The California section contains three segments (61 miles) of the ROW that were designated as high sensitivity. Within these portions, some sites would be expected to lie within the ROW and may be considered as eligible for nomination to the NRHP. About half of the high sensitivity portions of the ROW lies within Federal and state lands; the remainder lies on private lands (Tables 4.2.11-2 to -5).

Table 4.2.11-1 - Pipeline Segments and Land Ownership of Known Sites in Pactex ROW

Land Status	Sections[a] and Sites						
	POLA[b]	CA	AZ	WNM	FWTX-WTX	ENM	WCTX
Private	-	13	-	-	-	6	-
Agencies							
Local	3	-	-	-	-	-	-
State	-	-	2	-	-	-	-
Federal	-	4	13	-	20	3	-
Unknown	-	-	36	5	5	1	-
Total	3	17	52	5	25	10	-

[a]Corridor sections from El Paso to Midland are divided as follows:
POLA = Port of Los Angeles
CA = California
AZ = Arizona
WNM = Western New Mexico
FWTX = Far West Texas from El Paso to the Guadalupe Mountains
WTX = West Texas from the Guadalupe Mountains to the Texas/New Mexico state line
ENM = East New Mexico from the southern to the eastern state line
WCTX = West-Central Texas from the Texas/New Mexico state line to Midland
[b]LAHD jurisdiction.
Source: Summarized from various technical reports referenced in subsection 3.2.11.

Table 4.2.11-2 - Pipeline Segments and Ownership of ROW

Ownership	ROW Sections[a] and Lengths							Total (mile)
	POLA (acre)	CA (mile)	AZ (mile)	WNM (mile)	FWTX-WTX (mile)	ENM (mile)	WCTX (mile)	
Private	-	117	125	28	125	6	88	584
Agency								
Local	508[b]	53	120	47	0	8	-	229
Federal	-	52	112	73	7	64	-	212
Indian	-	6	-	-	-	-	-	6
Total	508[b]	228	357	148	132	78	88	1,031

[a]Corridor sections from El Paso to Midland are divided as follows:
POLA = Port of Los Angeles
CA = California
AZ = Arizona
WNM = Western New Mexico
FWTX = Far West Texas from El Paso to the Guadalupe Mountains
WTX = West Texas from the Guadalupe Mountains to the Texas/New Mexico state line
ENM = East New Mexico from the southern to the eastern state line
WCTX = West-Central Texas from the Texas/New Mexico state line to Midland
[b]POLA section given in acres (approximate); LAHD jurisdiction.
Source: Summarized from various technical reports referenced in subsection 3.2.11 and maps supplied by Pactex, 1985.

Table 4.2.11-3 - Ownership of High Sensitivity Pipeline Segments in the Pactex ROW (mile)

Section	Ownership of ROW			
	Federal	State or Local Agency	Private	Total
California	13	4	43	61
Arizona	18	37	40	95
West New Mexico	27	4	3	34
West and far west Texas	7	0	76	83
East New Mexico	42	8	5	55
West-Central Texas	0	0	34	34

Source: Derived from technical reports for cultural resources (referenced in subsection 3.2.11) and ownership maps provided by Pactex.

Table 4.2.11-4 - Ownership of Moderate Sensitivity Pipeline Segments in the Pactex ROW (mile)

Section	Ownership of ROW			
	Federal	State or Local Agency	Private	Total
California	0	7	5	12
Arizona	71	73	86	230
West New Mexico	8	5	3	16
West and far west Texas	0	0	35	35
East New Mexico	23	0	0	23
West-Central Texas	0	0	47	47

Source: Derived from technical reports for cultural resources (referenced in subsection 3.2.11) and ownership maps provided by Pactex.

Table 4.2.11-5 - Ownership of Low Sensitivity Pipeline Segments in the Pactex ROW (mile)

Section	Ownership of ROW			
	Federal	State or Local Agency	Private	Total
California	45	42	68	155
Arizona	24	12	1	27
West New Mexico	36	39	23	98
West and far west Texas	0	0	14	14
East New Mexico	0	0	0	0
West-Central Texas	0	0	7	7

Source: Derived from technical reports for cultural resources (referenced in subsection 3.2.11) and ownership maps provided by Pactex.

Construction would affect 10 listed or potentially eligible sites, portions of 3 additional sites that may be potentially eligible, and about 61 miles of ROW with high sensitivity for expected sites. These effects would be significant adverse impacts.

C. Arizona

Impacts along the Arizona and western New Mexico sections of the Pactex ROW would be virtually identical to those described for the All-American project (BLM, 1984a, pp. 4-87). Although pump station and valve sites would differ between the two projects, these facilities would lie within the same ROW as the pipeline, and the impacts of these facilities would be virtually identical to those of pipeline construction.

More than 52 known sites would lie within the construction ROW and could be impacted by construction. Other sites appear to be eligible for nomination to the NRHP if surveys and testing confirm their integrity. Several sites were reported to cover many acres and would be difficult to avoid by realignments. Because of their size, they may be eligible for the NRHP.

As indicated in Table 3.2.11-3, a third of the Arizona section was designated as high sensitivity, and most of the high valued portions occur on Federal or state lands (Tables 4.2.11-2 to -5), except in the Sulphur Spring Valley and San Simon Valley of eastern Arizona. A large portion of the ROW on the Santa Cruz Flats near Casa Grande was designated as moderate sensitivity and lies on private lands. These areas are expected to contain important sites that would be located during field surveys.

Construction would cause significant impacts to one site on the state inventory, several sites that are in review for the state inventory, and more than 35 sites that may be potentially eligible for nomination to the NRHP. Significant impacts may occur on as yet unknown but expected sites in the 95 miles of high sensitivity ROW, and some of these sites may prove to be eligible for the NRHP.

D. Western New Mexico

Five of 43 sites in New Mexico lie within the Pactex ROW, and all 5 sites were of unknown eligibility for listing on the NRHP. Within the corridor, 20 sites lie on Federal or state lands, 3 on private, and the remaining 20 on lands of unknown ownership (Table 4.2.11-1). High sensitivity portions of the ROW (34 miles) lie near Lordsburg and in the vicinity of the Rio Grande. Most of the high sensitivity portions lie on Federal or state lands, except for 6 miles near the Rio Grande (Tables 4.2.11-2 to -5). Because the high sensitivity portions would be expected to contain sites, some of these sites may be eligible for listing on the NRHP. Adverse construction effects on the expected sites and those on the five recorded sites would result in significant impacts if any prove to be eligible for listing on the NRHP.

E. Western Texas

Within the western Texas section of the corridor from El Paso to near the Pecos River, one site that lies adjacent to the ROW is listed on the NRHP, while the sites on Fort Bliss represent a unique and important district of protected cultural resources that are potentially eligible for listing on the NRHP. A total of 5 other sites was recorded west of Fort Bliss and in or near the Guadalupe Mountains. These sites were of unknown potential eligibility, but some may be assumed to be considered as eligible for listing on the NRHP.

As indicated in Table 4.2.11-1, most sites lie on the Federal lands of Fort Bliss, while other sites and most of the high sensitivity portions of the ROW lie on private lands (Tables 4.2.11-2 to -5).

F. Eastern New Mexico and West-Central Texas

No site within this section of the ROW was nominated to the NRHP, although review of the site records indicated that at least two sites may be potentially eligible for nomination. Ten of the 35 sites in the corridor of this section lie within the pipeline construction ROW and the Midland terminal site. Three sites lie on Federal land within the ROW, six on private lands, and one on land of unknown status, but probably private (Table 4.2.11-1).

Most portions of the ROW with high sensitivity (55 miles) in New Mexico would lie on Federal lands, while in west-central Texas the entire ROW, including 37 miles of high sensitivity areas, would lie on private lands, except when crossing state and Federal roads.

Construction impacts on the known ten sites in the ROW (perhaps potentially eligible for the NRHP) would be significant. The high potential for encountering new sites in several high sensitivity segments of the project ROW, including the terminal site, would indicate the potential for destroying some sites that may be potentially eligible for nomination to the NRHP and, thereby, the potential for additional significant impacts.

G. Indirect Impacts

Important known sites and areas where potential sites are expected along the proposed Pactex pipeline route and at the terminal sites would be adversely affected by construction and later by indirect effects from increased unauthorized access, unauthorized collection of artifacts, and vandalism of cultural resources.

Indirect impacts on cultural resources along the corridor and from the improved access would generally affect the ROW and variable portions of the corridor. Significant resources lie adjacent to the ROW but in the corridor. The relative magnitude of indirect effects would be generally proportional to those indicated by the sensitivity designation (Table 3.2.11-3) and would apply to the total of more than 100 corridor sites outside of the ROW and Fort Bliss. Even if only a portion of these sites (1 in 5) would prove to be eligible for nomination to the NRHP or state inventories, significant impacts would affect more than 20 sites.

Until final alignment has been completed, it is impossible to determine what sites in the corrridor, exclusive of those in the ROW, will be subject to direct or indirect impacts. Indirect impacts may result from uncontrolled access to and unauthorized collection of artifacts.

H. Summary

Impacts on cultural resources would occur from construction activities. After construction is completed, impacts from operation of the pipeline system would be confined to indirect impacts associated with uncontrolled access, unauthorized collection of artifacts, and vandalism of cultural resources.

4.2.12 PALEONTOLOGY

A. Introduction

Paleontologic resources in the project area would be subject to both the direct and indirect impacts that would accompany construction for the pipeline project. These impacts would be in addition to those that might have resulted from earlier construction in parallel ROWs. The most significant effects to these resources would be from direct impacts, those that directly affect fossils, fossil localities, and fossil-bearing and potentially fossiliferous rocks. Such impacts would arise from dredging in the harbor, trenching for the pipeline, and grading for terminal, pump station, and access road construction. For the most part, these impacts would be limited to the ROW and to the terminal and pump station sites, although areas outside the ROW might also be impacted by construction of access roads within the 1-mile-wide corridor and by excavation of rock for fill. Direct disturbances to bedrock usually end with construction. Covering of rocks by burial for road and building construction would be permanent, however, and would prevent future study of the rocks.

Indirect impacts are those that generally do not greatly disturb fossil-bearing or potentially fossiliferous rocks but last long after construction has ended. Exposure of rock during construction or spraying of herbicides to retard plant growth may subject these rocks to increased erosion and the loss of fossils. Unauthorized collecting of fossils by project personnel or amateur collectors results in increased attrition. ORVs often drive over localities and destroy fossils. Fossils are also subject to vandalism. The latter impacts would be an important consideration if the project were near urban centers and if easy access were afforded by construction of new access roads.

The relative importance of impacts to a particular area of exposure is proportional to the importance (high, medium, low) and amount of the formation or rock unit to be disturbed, as well as the percentage of the total undisturbed exposure of the unit that will be disturbed. However, in this report, major emphasis is placed on the importance of the unit and, to a lesser degree, on the amount of exposure of the unit to be disturbed. Without a regional study, it would be difficult to determine a rough percentage of undisturbed exposure of a unit that would be impacted. However, additional consideration could be given to important units of very limited geographic extent that would suffer unusually high degrees of impact, although, even in the most severe cases, such impacts would probably involve much less than 1% of the total undisturbed exposure of a unit.

Detailed information regarding the formations and resources to be disturbed in the corridor and ROW, as well as the amount and relative magnitudes of these disturbances, is contained in the Pactex paleontological resource technical report (Lander, 1985). This information, which will require updating prior to construction because of recent and possible future realignments, is summarized below by location and formation with emphasis placed on the importance of the formation to be disturbed. In this report, the importance of direct and indirect impacts to a particular formation is

considered to be the same level as the known or potential resources of that unit in the corridor. For example, impacts to exposures of a highly important formation would also be considered highly important.

B. Direct Impacts

Although very few if any of the 37 or more known fossil localities in the corridor would be disturbed by construction in the ROW, 970 miles, or about 95% of the ROW, would contain moderately to highly important formations that may contain fossils. About 508 acres of potentially moderately important strata would be impacted by dredging and filling in POLA. The more important of these formations, the amount of exposure to be impacted (in linear miles) and the importance of these impacts are listed in Table 4.2.12-1. About 90% of the corridor consists of unnamed moderately important Pleistocene continental deposits that would be impacted. Neither these deposits nor the formations in the corridor not exposed in the ROW are listed in the table.

C. Indirect Impacts

Many formations not present in the ROW are exposed in the corridor and, as with those formations exposed in both the corridor and ROW, would also be subject to indirect impacts. The 37 fossil localities they contain would also be subject to these impacts. All formations that would be subject to indirect impacts, the number of fossil localities they contain, and the importance of these impacts are listed in Table 4.2.12-2. Because its exposures are submerged, POLA would not be subject to the indirect impact of unauthorized collecting.

D. Summary

About 50 miles of highly important exposure (but few if any known fossil localities) would be affected by direct impacts within the ROW; however, at least 37 fossil localities would be affected by indirect impacts within the corridor.

Table 4.2.12-1 - Importance and Area (in linear miles) of Direct Impacts to Formations that Would be Disturbed in Pactex ROW (exclusive of some unnamed moderately important Pleistocene deposits)

Location	Formation[a]	Importance	Linear Miles
POLA	2.2.1	Moderate	508 (acres)
California	2.2.2	High	6.0
	2.2.6	High	2.5
	2.2.9	Moderate	2.1
Arizona	2.2.12	High	8.3
	2.2.15	High	22.0
	2.2.16	Moderate	25.0
Southwestern New Mexico	2.2.20	Moderate	3.8
West Texas	2.2.23	Moderate	10.4
	2.2.24	Moderate	0.8
	2.2.25	Moderate	4.2
	2.2.26	Low	0.8
	2.2.27	High	10.4
Southeastern New Mexico	2.2.28	Moderate	4.2
	2.2.29	Moderate	2.9
	2.2.30	Moderate	7.1
West-Central Texas	2.2.31	Moderate	0.4

[a]Formation numbers keyed to Lander, 1985.
Source: Lander, 1985.

Table 4.2.12-2 - Importance of Indirect Impacts to and Number of Fossil Localities in Formations in 1-Mile-Wide Pactex Corridor

Location	Formation[a]	Impact	No. of Localities
POLA	2.2.1	None	0
California	2.2.2	High	2
	2.2.3	Moderate	1
	2.2.4	High	1
	2.2.5	Moderate	4
	2.2.6	High	0
	2.2.7	High	16
	2.2.8	Moderate	1
	2.2.9	Moderate	0
	2.2.10	High	5
	2.2.11	Moderate	0
Arizona	2.2.12	High	0
	2.2.13	Moderate	0
	2.2.15	High	6
	2.2.16	Moderate	0
	2.2.17-18	Moderate	0
Southwestern New Mexico	2.2.19	Moderate	0
	2.2.20	Moderate	0
	2.2.21	High	1
	2.2.22	Moderate	0
West Texas	2.2.23	Moderate	0
	2.2.24	Moderate	0
	2.2.25	Moderate	0
	2.2.26	Low	0
	2.2.27	High	0
Southeastern New Mexico	2.2.28	Moderate	0
	2.2.29	Moderate	0
	2.2.30	Moderate	0
	2.2.31	Moderate	0
West-Central Texas	2.2.31	Moderate	0
	2.2.32	Moderate	0

[a]Formation numbers keyed to Lander, 1985.
Source: Lander, 1985.

4.2.13 VISUAL RESOURCES

The following subsection focuses on the probable impacts to visual resources associated with the implementation of the proposed Pactex pipeline.

Generally, the pipeline ROW would not be visually evident to people from nearby highways, roadside rest areas, parks, or recreation areas. An examination of various existing underground pipelines, which the Pactex proposal would parallel, indicated that they would not be visually evident from nearby travel routes or use areas. Where the pipeline would traverse gentle slopes (less than 5% slope), observation of the pipeline scar would be limited laterally from 0.25 to 0.5 mile. Traversal of steeper slopes (over 5% slope) would expose the pipeline scar to potential observation from the surrounding landscape (BLM, 1984a, p. 4-88). Most of the proposed pipeline route would traverse mainly flat agricultural or desert lands. These areas have been discussed in detail in the SOHIO draft EIS (BLM, 1976) and the Celeron/All-American draft EIR (BLM, 1984a). Portions of the proposed project involving aboveground facilities such as pump stations and powerline extensions would have greater exposure to observation from the surrounding landscape than the buried pipeline. Table 4.2.13-1 presents a visual resources analysis of the future visual conditions (FVC) that would be created as a result of the construction of the aboveground facilities from California to Texas. The FVC class descriptions are analogous to those used in subsection 3.2.13 for existing visual conditions.

A. Construction

1. POLA to Blythe. The proposed landfill island would reduce the open water area of the port, transforming the existing high visual quality open-water view to one of an industrial complex. In addition to the visual intrusion created by the landfill island, associated terminal features such as the storage tanks and support facilities would comprise visual obstructions. The primary obstruction to the visual quality of the outer harbor area would be the proposed 150-ft tower used to house the air emissions control equipment. Lighting systems on the proposed landfill would be evident within the project viewshed. The distance from the project site to potentially sensitive areas (residences) would minimize the intrusive nature of lighting glare. Because of the proposed placement of the landfill terminal, the visual impacts to harbor traffic, including recreational boaters, would be greater than for land viewers. The presence of construction equipment (dredges, cranes, earthmoving equipment, etc.) in the outer harbor would reduce the aesthetic quality of the harbor for the duration of construction. Construction of the pipeline system would increase harbor congestion, but no visual impacts would occur after placement of the submerged pipeline.

The construction of the pipeline in the greater Los Angeles urban area would have a temporary adverse visual impact on the immediate area for the duration of the construction. The aboveground valves and pipeline bridge across the Los Angeles River and Rio Hondo are visual intrusions that further degrade open-space value of the Los Angeles River, Rio Hondo, and San Jose Creek

Table 4.2.13-1 - Future Visual Conditions

Site or Facility	Future Visual Condition[a]	Description	Visible From
Los Angeles Terminal	V	Breakwater adjacent - warehouses, storage terminals, container terminals, and ship repair yards nearby.	Shoreline, approximately 2 miles
Wilmington Station	VI	In heavy industrial area with oil tanks, oil wells, and industrial plants.	California Highway 1 and Pacific Coast Highway
Rialto Station	V	In industrial area with oil tanks and cement plant.	I-10
Blythe Station	IV	In urban area near radio tower.	I-10
Colorado River Crossing	V	At the south edge of Blythe, near a campground, residences, light industrial facilities, a levee, an overhead suspension bridge for a pipeline, and I-10 and its attendant bridge over the Colorado River.	I-10 bridge and local roads
La Posa Station	IV	In the broad La Posa plain, flat desert near I-10.	I-10
Gila River Crossing	V	In the broad valley of the Gila River with existing pipeline bridges, U.S. 80 bridge, quarries, and Gillespie Dam.	U.S. 80 and the Gillespie Dam in the Arlington State Wildlife Area
Gila Station	IV	On a flat desert landscape with brush cover, an existing pipeline corridor, and nearby cultivated fields.	U.S. 80/U.S. 85
Coolidge Station	IV	On a flat, brush-covered, desert plain with existing roads and pipeline corridors.	U.S. 89/U.S. 85

Table 4.2.13-1 (Contd)

Site or Facility	Future Visual Condition[a]	Description	Visible From
San Pedro River Crossings	IV	A broad, gravel wash framed by desert mountains and canyons with existing roads on both sides of the river.	Not visible from any major travel route or use area
Reddington Station	IV	About 4 miles east of San Pedro River with similar views.	Not visible from any major travel route or use area
Lordsburg Station	V	A vast, brush-covered desert plain with an existing pipeline corridor, roads, railroads, and the town of Lordsburg nearby.	I-10
Akela Station	V	A vast desert with creosote and cacti, an existing pipeline, and communcations corridor with roads and railroads nearby.	I-10
Rio Grande River Crossing	V	In the broad Rio Grande floodplain with existing overhead pipeline crossings, a highway bridge, and roads and agricultural fields on both river banks.	Berino Road
Hueco Station	IV	Near Hueco Tanks State Park - existing pipeline corridor.	Not visible from park access road or other highway
Pecos River Crossing	V	Existing pipeline crossings, roads, and nearby compressor station.	Not visible from any major travel route or use area
Jal Station	V	Semidesert with grass, cultivation, and existing pipeline corridor with large oil tanks nearby.	NM 18
Midland Terminal	V	Scrub brush on an industrial area with large oil tanks, pipelines, and steets adjacent.	I-20 and County Roads 307 and 715

[a]See Table 3.2.13-1 for definitions of visual condition types.
Source: ES, 1985.

corridor. Similarly, the proposed aboveground valves in other locations constitute an obvious aboveground industrial facility that would adversely impact their immediate surroundings.

The pipeline route through much of California would traverse open space/desert lands. Construction of the pipeline would cause small-scale alteration of landforms and also removal of vegetative cover. However, the resulting degradation of scenic and open-space values would be only temporary.

Construction of a submerged crossing of the Colorado River near Blythe would no doubt visually increase the sediment load of the Colorado River downstream of the crossing to the Imperial Dam, thereby degrading the visual character of this popular recreational reach for the duration of the construction period.

Construction of the three pump stations for the pipeline segment from POLA to Blythe would constitute a permanent visual intrusion within the surrounding area. The Wilmington and Rialto pump stations are within an industrial area, and pumps there would not have a significant adverse visual impact. The Blythe pump station would be located within the viewshed of a residential area. However, existing visual intrusions would reduce the visual impacts of the pump station to the surrounding neighborhood.

In addition to the pumping stations discussed above, visual impacts would also occur from the extension of overhead electrical service to the three pumping stations. At each of these sites, slight visual impacts would occur due to the placement of the transmission lines on wooden pole or aluminum H frames. The visual impacts of such a utility are generally acceptable unless the area is unroaded/undeveloped, has a high scenic value, or has a high visual sensitivity. Given the setting for the proposed transmission lines, significant impacts would not be anticipated.

2. Blythe, California, to Pine Springs, Texas. Much of the pipeline ROW would parallel existing highways and pipeline systems. The land traversed by the pipeline would be extensive open-space, desert land. The visual diversity of this area is low; however, due to the wide expanse of open space, the scenic quality is moderatly high. Visual impacts associated with pipeline construction would be minor and of a short duration. During construction, small-scale alterations of landforms and removal of vegetation along the ROW would be expected. After construction had been completed and natural revegetation had occurred, visual impacts of the pipeline would be minimal.

Construction of the seven pump stations along the route - La Posa, Gila, Coolidge, Redington, Lordsburg, Akela, and Hueco - would have varying degrees of visual impacts depending on their proposed placement. The La Posa, Gila, and Coolidge stations in Arizona would not dramatically reduce the visual quality of the surrounding area because the existing visual environment is not highly scenic. The Redington station would be located in slighty higher scenic landscape; however, the pumping facility would not be visible from any major travel route or use area. The Lordsburg and Akela pumping stations in New Mexico would be located in areas with existing visual intrusions; the

visual impacts would not be considered major. The last pumping station for this segment is the Hueco station in Texas. The proposed location of the pumping facility would be near Hueco Tanks State Park, an area with high visual sensitivity. The pumping station would be placed within an existing pipeline corridor and would not be visible from park access roads or other highways.

Transmission lines servicing the pump station would be a long-term intrusion to the visual landscape. Table 2.2.1-4 lists the approximate lengths of the utility lines for each station. The impacts associated with the placement of transmission lines would depend on the existing visual environment, other visual intrusion in the surrounding area, and the visibility of the powerlines from roads and developments. The extent of the visual impacts would generally be consistent with those of the pumping stations listed above.

3. Pine Springs to Midland. The pipeline would largely traverse areas with relatively low scenic quality and visual sensitivity. Therefore, the visual impact of the proposed project would be relatively insignificant. Impacts associated with construction would be minor and of a temporary duration. From the New Mexico border to Midland, much of the existing landscape is currently utilized for oil industry activity; thus, the proposed pipeline system would not be a visual intrusion. Placement of the Jal pumping station and transmission lines, as well as the Midland terminal, would not greatly distract from the existing visual quality of their locations. Both facilities would be placed in areas with existing visual intrusions.

B. Operation

Operation of the proposed project would have limited impacts to the visual environment. No adverse impacts would be expected after the placement of the pipeline was complete. The landfill island would be a continuous visual intrusion on the scenic quality of the port. Operation of the pumping stations would also constitute a long-term visual impact. Potential degradation of the visual environment would occur from a major oil spill. Any oil spill in the harbors that is not boomed and cleaned up could wash up on Los Angeles and Long Beach beaches. Major oil spills would severely degrade the scenic quality of the beach until cleaned up. An oil spill at the Colorado River crossing could potentially reach Imperial Dam before cleanup began. Riparian shoreline vegetation might be destroyed, creating an unsightly area along the river until vegetation could reestablish itself.

C. Summary

Short-term visual impacts would occur from construction activities. Once construction is completed, impacts from operation of the pipeline system would be confined to those associated with oil spills. The greatest impact on the scenic environment would occur from the aboveground facilities. The landfill terminal in POLA along with the 11 proposed pumping stations constitute long-term intrusions into the visual environment. No significant visual impacts are expected because no change in the viewshed character or category would occur.

4.2.14 NOISE

The impact of project-generated noise can be evaluated by considering criteria such as the disruption of speech and sleep, the increase in annoyance, and the perceived change in ambient sound levels. Some governmental agencies have incorporated these criteria into their land-use plans, as indicated in Appendix E. The U.S. Environmental Protection Agency recommends that the long-term average L_{dn} in residential and other noise-sensitive areas should not exceed 55 dBA but has no similar guidelines for short-term construction noise (EPA, 1974). Other than these guidelines, neither the Federal government nor the States of California, Arizona, New Mexico, or Texas have specific regulations for community noise that would affect the proposed project. However, the state of California does require that counties and cities in the state prepare and implement noise elements as part of their mandated general plans [(California Government Code ss. 65302 (g)]. The state has also issued guidelines for the preparation of the noise elements indicating the relative acceptabililty of a range of community noise exposure levels for major land-use categories. A brief list of policies and guidelines used by the State of California and the Counties of Los Angeles, Riverside, and San Bernardino are provided in Appendix E.

A. Construction Impacts

Noise effects from construction of the pipeline are a function of the noise generated by construction equipment, the location and sensitivity of nearby land uses, and the timing and duration of the noise-generating activities.

Table 4.2.14-1 lists each major construction location, the noisiest equipment used in each location, the maximum equipment noise levels at 50 ft, the number of pieces of equipment, the number of days in use, and the percentage of time that the equipment is used each day. Based on these values, an overall estimate is made of the noise levels at 1,000 ft from the operating equipment. This estimate assumes that noise decays at a rate of 6 dBA per doubling of distance, which is a worst-case assumption that does not include additional attenuation caused by atmospheric absorption, terrain, and meteorological conditions. If higher attenuation rates were assumed, the estimated impacts would be less than those shown.

1. Harbor Area. Table 4.2.14-1 shows that the pile driver used in offshore construction is the noisiest piece of construction equipment on the project, producing an average level of about 65 dBA at 1,000 ft during its 30-day use. At the closest receptors to this noise source, almost 2 miles to the north at the Navy housing facilities on Terminal Island, pile-driving levels would be about 45 dBA, which would not be disturbing in that area during the daytime. At receptors 2 miles to the west in San Pedro, the average pile-driving level would be under 45 dBA. Pile driving would be audible at this level, but would not disturb schools or residents in San Pedro.

Noise levels from other construction sources, including the construction of offshore, berth, and metering facilities, would generally not exceed 61 dBA at a distance of 1,000 ft. Noise levels at 2 miles would be well below ambient conditions and would not be disturbing.

Table 4.2.14-1 - Construction Equipment Noise Levels and Usage

Construction Location	Equipment Group[a]	Maximum Noise Levels at 50 ft[b] ($L_{A\ max}$, dBA)	Number of Units[c]	Days in Use[d]	Time in Use (%)[e]	Estimated Average Noise Levels at 1,000 ft (L_{eq}, dBA)[f] Group	Total
Offshore civil construction	Pile hammer	100	1	30	40	65	65
	Dredge (24 hr)	75	1	60	65	47	
	Other	75-87(82)	11	20-180(100)	20-70(45)	55	
Berth and metering facilities	Pavement breaker	88	1	20	70	55	61
	Other	75-86(82)	38	20-250(135)	10-70(40)	60	
Pump stations and terminal	Mobil crane	85	1	80	40	50	58
	Other	75-84(80)	26	4-120(62)	10-70(40)	57	
Pipeline (harbor to Wilmington)	Pavement breaker	88	1	190	75	56	66
	Other	75-86(82)	87	65-350(208)	10-80(45)	65	
Pipeline (Wilmington to Walnut)	Grader	86	1	370	50	52	64
	Other	75-85(81)	74	75-370(223)	10-80(45)	63	
Pipeline (Walnut to Beaumont)	Grader	86	1	108	60	53	66
	Other	75-85(81)	121	60-108(84)	15-80(48)	66	
Pipeline (Beaumont to Midland)	Grader	86	1	230	60	50	67
	Other	75-85(81)	136	90-260(175)	15-83(49)	67	

[a]Only the noisiest equipment is listed individually. A full list of equipment is provided in Appendix A.
[b]Harris, 1979; EPA, 1975. Values in parentheses ( ) are averages.
[c]From Appendix A. Units are major pieces of equipment. Values in parentheses ( ) are averages.
[d]From Appendix A. Values in parentheses ( ) are averages.
[e]Percentage of time during workday when equipment is used. Workday is 7 a.m.-5 p.m. for all equipment except dredge. Values in parentheses ( ) are averages.
[f]Estimated from previous columns as follows:

$$L_{eq}\ (1{,}000\ ft) = L_{A\ max} + 10 \log N + 10 \log (d/D) + 10 \log (T/100) + 20 \log (50/1{,}000) - K$$

where,

$L_{A\ max}$ = average maximum noise level
N = number of units (pieces of equipment)
d = average number of days in use
D = maximum number of days in use
T = average percentage of time in use
K = differences between maximum and average noise levels produced during equipment operation (assumed to be 5 dBA; for dredge, assumed to be 0 dBA)

Source: Harris, 1979; EPA, 1975; Pactex, 1983b.

The dredge is the only major piece of equipment used over a full 24-hour period on the project. The noise level of this equipment is only 47 dBA at 1,000 ft; therefore, it is not a major contribution to overall noise levels. Because this is the only piece of construction equipment operated at night, construction of the project would not impact sleep or other noise-sensitive nighttime activities.

2. Pump Stations. Pump station construction requires a relatively small number of pieces of equipment (total of 27) at relatively modest noise levels (75 to 84 dBA at 50 ft). The overall levels from this activity would average about 58 dBA at 1,000 ft during the few days of peak construction. The total duration of pump station construction activity is approximately 4 months.

The nearest receptors to pump stations are residences and two schools located about 0.75 mile from the Wilmington pump station and residences located about 1 mile from the Rialto pump station. All other pump stations and receptors are at least 4 miles away (Table 3.2.14-2). At 0.75 mile, pump station construction noise levels would peak at about 46 dBA, which is well below the daytime average noise levels in the Wilmington/Long Beach area; therefore, it would not affect average day-night levels.

At 1 mile, pump station construction levels would peak at about 43 dBA, which is 10 dBA below the estimated existing daytime levels in Rialto. This would not increase the average day-night levels and would not be disturbing to the community during the 4-month construction period, particularly because no construction activity would take place at night.

At 4 miles, without considering atmospheric or terrain-related attenuation, pump station construction noise levels would reach a maximum of 31 dBA, which is 7 dBA below the daytime ambient level listed in Table 3.2.14-2 for Jal, New Mexico. This activity would not increase day-night levels and would barely be noticed.

3. Storage Terminal - Midland, Texas. Construction of the storage terminal at Midland is expected to generate noise levels of about 43 dBA at a distance of 1 mile. The expected existing daytime level at this distance is about 48 dBA. The logarithmic sum of these two values is about 50 dBA; therefore, the overall levels will be increased by about 2 dBA. This increase will be noticed, but it is unlikely to be disturbing to residents; it represents little change in the perceived noise environment. The average day-night levels would be increased by less than 1 dBA.

4. Pipeline. Construction of the pipeline would involve between 75 and 137 pieces of equipment spread out along the pipeline route. Overall noise levels are expected to reach about 64 to 67 dBA at 1,000 ft from the pipeline. The values shown in Table 4.2.14-1 were used to estimate noise levels from construction activities at potentially sensitive receptor locations along the pipeline route. Locations along the pipeline where sensitive receptors are located are shown in the pipeline alignment figures in Appendix J under the land-use column. The noise estimates, based on the distances shown in Tables 3.2.14-2 and 3.2.14-3, as well as the total noise levels shown in Table 4.2.14-1, are shown in Table 4.2.14-2. Only those receptors are shown where

Table 4.2.14-2 - Construction Noise Levels Along Pipeline

Location	Receptor	Daytime Noise Level from Construction (L_{eq}, dBA)	Increase in Existing Noise Level	
			Daytime (L_{eq}, dBA)	Day-Night Average (L_{dn}, dBA)
North Long Beach	Union and Sutter Schools	76	13	8
	Residences	76	13	8
Paramount	Dominguez High School	64	2	0
	Residences	76	13	8
South Gate	Residences	76	18	12
	Los Padrinos Juvenile Hall	62	4	1
Pico Rivera	John A. Ford Park	70	12	7
	Rio Hondo Country Club	84	26	20
	Residences	84	26	20
	St. Vincent's Seminary	59	6	3
	Rio Hondo Park	70	17	11
Montebello	Park	66	13	8
	Residences	66	13	8
	Pio Pico School	60	7	3
City of Industry	Residences	70	17	11
	Wildlife Sanctuary and Park	55	4	0
	Equestrian area	66	8	4
	California Country Club	70	1	0
	Latin American Bible Institute	66	8	4
Walnut	Walnut School	68	15	9
	Residences	52	5	2
Chino	California Institute for Men	56	8	4
	Hawthorne Christian School	74	16	10
	Residences	80	32	27
Fontana	Fontana Bird Park	60	17	12
Crestmore	Crestmore School	62	14	8
	Park	62	14	8
	Residences	78	30	25
Loma Linda	Union Academy	48	1	0
	Hospital	53	5	2
	Loma Linda University	50	4	1
	Community Hospital	50	4	1
	Bryn Mawr	50	7	3
	Residences	62	14	8
Banning	Residences	73	25	20
Desert Center	Residences, School	67	24	18
Blythe	Residences	59	16	10
Midland	Residences	53	5	2

Source: Derived from total estimated average noise levels at 1,000 ft shown in Table 4.2.14-1, using distances shown in Table 3.2.14-3 and noise level decay rate of 6 dBA per doubling of distance.

the existing average day-night noise level would be increased as a result of construction activities. The estimated number of days that any receptor would experience the increased noise levels is about 1 week in urban areas and about 2 to 3 days in rural areas.

Table 4.2.14-2 also shows that many areas will experience temporary increases in noise levels because of pipeline construction activities. The greatest temporary impacts would occur near the Rio Hondo Country Club and residences in Pico Rivera and residences in Chino, Crestmore, Banning, and Desert Center. Lesser increases in noise levels would occur at residences in South Gate, Rio Hondo Park, The City of Industry, Walnut School, Hawthorne Christian School, Fontana Bird Park, and some residences in Blythe. Because this impact is only temporary, existing noise guidelines for Los Angeles, San Bernardino, and Riverside Counties would not be violated.

B. Operational Impacts

The operational noise impacts along each of the project segments are discussed below.

1. Harbor Area. Noise-generating activities from project operations in the harbor area include tanker/tug traffic, dock machinery, and material and maintenance truck traffic to and from POLA. Marine vessel traffic to and from the port would be increased about 10% as a result of the Pactex project. This increase represents less than a 0.5-dBA change (calculated as 10 log 1.1 = 0.4) relative to present marine vessel traffic levels and would, therefore, not be noticed. The levels generated by machinery connecting to and disconnecting from the tankers in the process of offloading oil are not expected to exceed ambient conditions in the harbor area beyond 1,000 ft from the source. Truck and commuter traffic to and from POLA caused by Pactex would not noticeably add to the noise levels in neighboring streets because of the small changes in traffic volumes involved.

2. Pump Stations. The primary source of noise from pump stations will be the mainline pumps. These will be situated at ground level and will not be enclosed. Up to three pumps will be located at one station. The noise level from each pump is stated by the manufacturer to be 91 dBA at 3 ft (United Pumps, 1985). If all three pumps were in operation, then the noise level at the nearest residence to any of the pump stations (0.75 mile away) would be 34 dBA. Noise levels at other residences near other pump stations would be lower. These levels would not be audible.

3. Storage Terminal. Operations at the storage terminal in Midland, Texas, would generate little noise impact. Occasional inspections of the terminal would generate additional light vehicle traffic. No other operations would be audible from nearby residences.

4. Pipeline. The pipeline route and valves would be inspected weekly or biweekly. The only noise sources associated with inspection are the transportation vehicles used by the inspection personnel. In remote areas, inspections would be performed by low-flying aircraft (500 to 1,000 ft aboveground). Small aircraft would create noise levels of 75 to 80 dBA at

flyover heights of 500 to 1,000 ft. In more settled areas, inspections would be performed by automobiles or light-duty trucks. Inspection noise levels from light-duty trucks would be on the order of 50 dBA at 50 ft to 100 ft.

C. Summary

Construction of the proposed pipeline would have no noise impact in the harbor area, near pump stations, or at the Midland Terminal. Significant temporary increases in noise levels would occur during the construction phase near residences, schools, and other noise-sensitive land uses along some portions of the pipeline route that pass through urban and suburban areas. The greatest temporary impacts would occur near the Rio Hondo Country Club and residences in Pico Rivera and residences in Chino, Crestmore, Banning, and Desert Center. Lesser increases would occur at residences in South Gate, Rio Hondo Park, The City of Industry, Walnut School, Hawthorne Christian School, Fontana Bird Park, and some residences in Blythe. Operation of the pipeline system would not cause significant noise impact near any of the pipeline route segments, pump stations, terminal, or harbor facilities.

4.2.15 OCEANOGRAPHY AND MARINE BIOLOGY

A. Dredge and Fill Components

The impacts of the proposed landfill island on physical oceanography are based on a model study for a substantially larger island (Seabergh, 1984) and the professional opinion of the COE harbor model specialist (Seabergh, 1985) reproduced in subsection 6.3.

1. Tidal Velocity, Discharge, Flow Volume, and Circulation. There would be no significant impact on the existing conditions of tidal elevation, amplitude and phase, or tidal flow caused by the proposed landfill island. There would be a reduction in tidal prism of about 35 million ft^3 from displacement caused by the proposed landfill island. There would also be a decrease of flow volume of approximately 3% through Angel's Gate because the proposed landfill island is in a region where the outer harbor is filled by flow through Angel's Gate (Seabergh, 1985).

The proposed landfill island would cause minor disturbance to the clockwise gyre in the outer harbor; however, the dominance of the gyre as a surface circulation pattern should be maintained. Therefore, outer harbor circulation should be affected minimally when compared to existing conditions. Because the proposed landfill island does not appear to change outer harbor circulation, significant changes in tidal circulation in the inner harbor would not be expected (subsection 6.3).

2. Harbor Resonance. Harbor resonance impacts from the proposed landfill island have not been modeled. A previous modeling effort for a significantly larger and different configuration island (Seabergh, 1984) indicated several impacts that may be applicable to the proposed landfill island. Changes in harbor oscillation from the proposed landfill island most likely would be small (subsection 6.3).

The effect of changes in wave-height amplification or a shift in period of maximum amplification cannot readily be evaluated until the response functions of the ships using the harbors are known, nor can frequency and duration of adverse ship mooring be determined without frequency of occurrence data for incident long-period waves (Seabergh, 1984). Without ship response data, the effect of changes in resonant oscillations in the harbor must be inferred from comparison with existing conditions and from comparison between various berthing areas in the harbor for existing conditions (Seabergh, 1985).

For the Pactex tankers in the 80,000- to 225,000-dwt class, critical wave heights of 6-ft head and quartering waves as well as 2-ft beam waves of short periods (8-25 seconds) were used to assess operational downtime (Pactex, 1985). The downtime presented in Table 4.2.15-1 represents the estimated number of days that the critical short period wave height is exceeded per year at two mooring sites on the south side of the proposed landfill island (Figure 4.2.15-1). Table 4.2.15-1 shows that critical wave conditions (as defined above) create a downtime of 75 and 5 days at the west and east mooring sites, respectively. Some additional downtime may result from wave

Table 4.2.15-1 - Estimated Downtime (days per year)

Critical Wave Conditions	Site[a] A	Site[a] B
H_{beam} = 2 ft	74	5
$H_{quartering/head}$ = 6 ft	1	0.0
Total	75	5

[a]Sites A and B are shown in Figure 3.2.15-1.
Source: Pactex, 1985.

transmission through the Angel's Gate (Pactex, 1985). Downtime would be reduced to 0.73 and 1.28 days per year if critical wave heights are greater than 2 ft on the beam and 6 ft on the quarter caused by a much lower frequency of occurrence of these conditions (Pactex, 1985). Until detailed information on moored ship response as a function of wave amplitude and frequency is available, definitive conclusions on ship motion and potential impacts cannot be made (Seabergh, 1985).

3. Water Quality.

a. Construction. Dredge and fill activities relating to island construction and channel deepening would occur over a 15-month period (Pactex, 1985). During this period, significant impacts on water quality from increased suspended sediments could occur. The resuspension of sediments would cause an increase in turbidity with a concurrent decrease in light transmittance (transparency), a possible increase in dissolved nutrient levels, decreases in dissolved oxygen, and the possible resuspension of contaminated sediments (if any exist in the dredge or fill footprint) containing oil and grease, heavy metals, chlorinated hydrocarbons, and polychlorinated biphenyls (COE-L.A. Harbor Department, 1980, p. 51; COE, 1973).

Dredging inside the harbor will be carried out by one or two dredges working shifts of 16 hours per day (Pactex, 1985). The extent and amount of dredge-related turbidity and settleable solids will depend on the type of mechanical dredge used and the sediment characteristics. Of the main types of sediment found in surface and core samples in the area of the proposed dredging (sand, silty sand, silt and clay), the finer silts and clays are the most likely to be resuspended. Pactex expects to use a hydraulic cutterhead dredge inside Angel's Gate, a hopper dredge system outside of Angel's Gate, and a clamshell dredge for the pipeline trenching. Elevated levels of suspended materials are localized in the area of the dredge with the

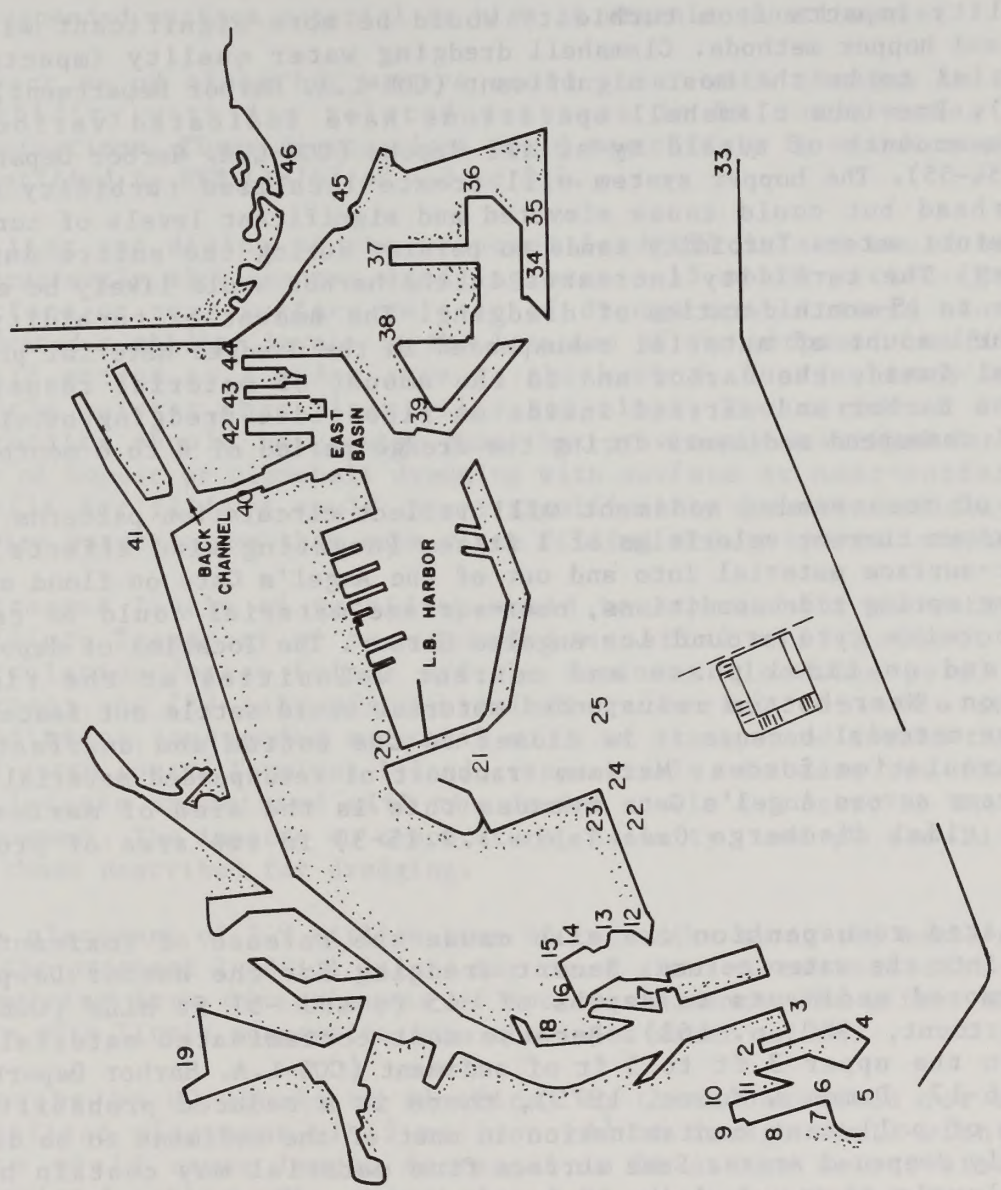


Figure 4.2.15-1 - Harbor Resonance Model Gauge Stations
(Seabergh, 1984) (not to scale)

cutterhead method (COE-L.A. Harbor Department, 1980, pp. 54-55). With this method, very little turbidity would be carried up to the surface through the water column. The turbidity in the water column above the cutterhead could be comparable to background levels measured 240 ft from the dredge (COE-L.A. Harbor Department, 1980, pp. 54-55).

Water quality impacts from turbidity would be more significant with the clamshell and hopper methods. Clamshell dredging water quality impacts have the potential to be the most significant (COE-L.A. Harbor Department, 1980, pp. 54-55). Previous clamshell operations have indicated various and continuous amounts of turbidity at all depths (COE-L.A. Harbor Department, 1980, pp. 54-55). The hopper system will create localized turbidity around the cutterhead but could cause elevated and significant levels of turbidity from the return water. Turbidity tends to persist during the entire duration of dredging. The turbidity increases in the harbor would likely be evident for the 12- to 15-month duration of dredging. The amount of turbidity will reflect the amount of material resuspended in the dredged material proposed for removal inside the harbor and to the amount of material resuspended outside the harbor and carried inside on floodtide. Dredging outside the harbor will resuspend sediments during the dredge period of 4 to 6 months.

Transport of resuspended sediment will reflect circulation patterns in the harbor. Maximum current velocities of 1 ft/sec (negating wind effects) will carry near-surface material into and out of the Angel's Gate on flood and ebb tide. During spring tide conditions, near-surface material could be carried by the clockwise gyre around Los Angeles Harbor. The location of deposition would depend on tidal phase and current velocities at the time of resuspension. Near-bottom resuspended material would settle out faster than near-surface material because it is closer to the bottom and unaffected by surface circulation forces. Maximum transport of resuspended material would probably occur across Angel's Gate because this is the area of maximum ebb and flood tidal discharge (see Table 3.2.15-3) in the area of proposed dredging.

Dredge-related resuspension can also cause the release of toxicants and pollutants into the water column. Recent dredging for the Harbor Deepening Project removed sediments to depths of -45 ft and -51 ft MLLW (COE-L.A. Harbor Department, 1980, p. 162). Because most contaminated materials are expected in the upper 3 ft to 5 ft of sediment (COE-L.A. Harbor Department, 1980, pp. 16-17; Dames & Moore, 1975), there is a reduced probability of occurrence of pollutant contamination in most of the sediment to be dredged from recently deepened areas. Some surface fine material may contain higher pollutant levels than underlying coarser materials. Surface materials in all areas of the proposed dredge footprint have not been assayed since harbor deepening.

Reduction in dissolved oxygen (DO) concentrations could be a significant impact associated with turbidity increases. The surfaces of resuspended finer sediments, silty sand, silts and clays, and associated organics cause DO adsorption, which can create localized DO decreases. Decreases in DO can also be caused by reduction of primary productivity caused by a decrease in transparency of the water column.

Natural fluctuations in DO, such as large summer DO decreases in the outer harbor, could synergistically, with dredging-related DO decreases, cause levels to fall below the standards of 5 ppm (static) and 6 ppm (annual average) administered by the RWQCB (SWRCB, 1979).

Dredging activities should not cause any impacts on existing conditions of salinity and temperature. Slight increases in nutrients could occur if resuspended surface material is high in organic constituents.

Impact on pH of harbor waters could occur with changes in DO. Increased turbidity with its related decrease in DO could cause localized pH fluctuations. These fluctuations would most likely be within the normal range identified by HEP (1976) of 7.3 to 8.7.

Filling and diking of the proposed landfill island would be carried out concurrently with channel dredging over a 15-month period (Pactex, 1985). Surface or near surface release of dredge spoils would cause significant elevated turbidity levels in the location of the proposed landfill island and could extend to a wider area in the harbor. Coarse, sandy materials would settle quicker than finer silts and clays. The vertical extent of the turbidity should be greater than that previously described for dredging. The use of hopper or clamshell dredging with surface or near-surface release of spoils for filling could cause significantly greater turbidity spanning the entire water column than subsurface filling with a hydraulic system.

Increased levels of turbidity would be expected for the entire duration of filling. Transport of resuspended material will reflect (1) surface circulation forces (winds and the dominant clockwise gyre) in the outer harbor, and (2) subsurface tidal flow. During ebb tide and floodtide conditions, suspended material will be transported toward the Angel's Gate and north toward Terminal Island, respectively. Release and resuspension of pollutants associated with the dredge spoils can occur at the time of spoil placement. The impacts on temperature, salinity, and pH should be identical to those described for dredging.

The placement of 2.9 million tons of rock dike along the south and east sides of the proposed landfill island may cause short-term increases in turbidity resulting from disturbances of bottom sediments. The effect should be short term with little suspension into the upper water column.

Impacts on DO should be identical to those described for dredging. The localized placement of 15 million yd^3 of dredge spoil within a 208-acre site could cause larger decreases in DO at the island site than at the dredging locations. The magnitude of DO change will relate to the rate of spoil placement.

The RWQCB usually sets a limit of 1 mg/liter/h for settleable solids from dredge return water (Schinazi, 1985; COE-L.A. Harbor Department, 1980, p. 54) during filling operations. With the Harbor Deepening Project, this standard

was consistently exceeded for the 190-acre landfill area during the final filling phase. This resulted from reduction in settling volume above the fill as the fill neared the surface of the water column (Schinazi, 1985). The decision was made by the RWQCB to allow the filling to be completed. However, in future projects, the RWQCB will address methods of maximizing settling velocity and rate to avoid exceeding the standard. Based on the above observations, the increased turbidity (settleable solids) and DO impacts of filling the proposed landfill island could be significant and occur as the fill level approaches and reaches the water surface.

b. Postconstruction. Postconstruction water quality dredge impacts are limited and associated with reduced flow velocities of approximately 15% (Seabergh, 1985) in channels deepened from 52 ft to 75 ft. This could cause localized decreases in DO (Maurer, 1983). Postconstruction water quality fill impacts would relate to resuspension of sediments from the nondiked north and west sides of the proposed landfill island.

The undiked sides of the proposed landfill island could provide a source of sediment and leachate that, because of precipitation or wave condition, could be chronic. Surface areas of the landfill island that lack an impervious cover could allow rainwater to percolate down and create an elutriate source. This elutriate would not have a significant impact, providing the island sediments are low in associated contaminants. Some turbidity will also be created by the elutriate and by continuous resuspension of sediment materials from the beach areas on the north and west sides.

Dye patterns of Terminal Island sewage effluent with the proposed landfill island would most likely be similar to those for existing conditions (Seabergh, 1985). There should, therefore, be no impact from the dispersion of the effluent.

4. Sediment Regime.

a. Construction. Dredging activities would completely alter the sediment regime in all channel areas from existing conditions. Finer materials, clays, and silts (with organic and possibly contaminant constituents) would be removed. Deeper sediments comprised of 70% to 90% sand with occasional lenses of clay and silt would become the new surface sediments. Finer material that may contain organic and pollutant constituents would be redeposited on the dredged areas from the water column and from the collapse of side slope areas.

The sediment regime of the proposed 115-acre island fill site would be completely altered by the deposition of 15 million yd^3 of dredge material. The island and beach area would be mainly composed of sandy materials. The south and east perimeters, an area of 25 acres, would have the existing sediment covered by the rock dike. The beach area would incur the continual deposition and erosion of finer surface sediments during calm wind and wave conditions and coarser material during more extreme conditions. At this time, it is difficult to discern whether the beach area would function primarily as a net source or sink for transported sediments during construction.

b. Postconstruction. Sediment, probably silts and clays, could be redeposited on dredged areas because of a 15% velocity reduction in channel areas and the tendency of dredged channels to act as sinks for bed load sediments (Seabergh, 1985). Proposed channel slopes of 3:1 should be stable for the primarily sandy material but would occasionally erode from the top of the slope down into the channel.

5. Habitat. Emphasis here is on short- and long-term habitat changes, impacts on speciation and diversity, physiological impacts, and possible impacts on trophic interactions. Long-term (greater than 2 years) or loss of habitat may be considered more critical to the health and carrying capacity of the harbor and the surrounding waters than short-term impacts (Reish, 1983). These types of impacts are defined as significant.

a. Phytoplankton.

i. Construction. Phytoplankton are affected physically and physiologically by suspended sediment and turbidity generated during dredging activities. Reduction in available light causes a reduction in photosynthesis with a concurrent decrease in population growth. Phytoplankton are also affected by turbidity-related changes in concentration of nutrients and DO. Any beneficial impact of growth rate increases caused by nutrient enrichment would be short term because the outer harbor sediments are not likely to contain much enrichment beyond surface sediments.

Dredge activities over the 12- to 15-month period inside the harbor (16 hours per day) could result in a temporary reduction of species numbers and diversity in the localized area of dredge work and in adjacent areas affected by the turbidity plume. Shade-adapted species may achieve a relatively temporary increase in abundance (Maurer, 1983) although nutrient availability is often the limiting factor.

Phytoplankton may also be physically entrained and mechanically trapped by sinking particles and clay flocs (COE-L.A. Harbor Department, 1980, p. 56). Spatial and temporal impacts on phytoplankton during dredging operations are difficult to assess. Inner harbor and channel areas should be unaffected except where turbidity plumes extend far from the dredge location. The outer harbor within the clockwise gyre will be the most affected area over the 12 to 15 months of dredging. Because the operational control of the harbor phytoplankton population is regulated by the synergistic occurrence of available light, nutrients, DO, temperature, salinity, and grazing, the localized short-term increases and decreases in population and diversity are likely during channel and berth dredging.

Habitat changes for phytoplankton during dredging relate to gradual increases in the depth of the water column in the outer harbor channels. There will be a 12- to 15-month loss of suitable habitat in areas of high turbidity where available light and/or DO and nutrients fall below threshold levels necessary for promoting growth.

During channel dredging, decreases in phytoplankton populations could reduce available food for grazing by zooplankton. The impact of a decrease in primary production on the higher trophic levels, invertebrates, fish, etc. could last beyond the 12- to 15-month dredge period. Filling and diking operations would cause similar turbidity-related impacts on phytoplankton. Population growth and diversity would likely be reduced in the immediate fill area because of turbidity.

ii. Postconstruction. Minimal turbidity should be generated from the dredged channels and landfill island. The minimal effects on outer and inner harbor circulation (Seabergh, 1985) are not expected to impact abundance and diversity of phytoplankton.

b. Zooplankton.

i. Construction. Zooplankton would be affected by increased turbidity associated with dredge and fill activities. Decreases in DO associated with increased turbidity have been shown to decrease the mean percentage of survival of the copepod Acartia tonsa. The primary effect of turbidity and suspended solids on zooplankton appears to be feeding interference (COE-L.A. Harbor Department, 1980, p. 59). Zooplankton subjected to mixtures of phytoplankton and suspended sediments are unable to feed selectively and thereby incur a reduction in feeding rates (COE-L.A. Harbor Department, 1980, p. 59). Dredge and fill generated turbidity and suspended sediments can affect zooplankton populations by covering eggs and reducing or impairing larval development. The ability of zooplankton to molt through various stages can be impaired by increased suspended sediment levels (COE-L.A. Harbor Department, 1980, p. 59).

Increased turbidity levels over the 12- to 15-month dredge and fill period could cause temporary decreases in abundance and speciation in the outer harbor within the area affected by the turbidity plume. The species most likely affected in the outer harbor would be Acartia tonsa, Corycaeus anglicus, Evadne nordmanni, Podon polyphemoides, and Penilia avirostris. Turbidity-related impacts could affect the average outer harbor zooplankton baseline concentrations of 3,000 to 4,000 per cubic meter. Table 4.2.15-2 shows that invertebrate larvae and copepods experience feeding disruption, growth reduction, and death when exposed to turbidity levels of 0.75 g/liter to 3.0 g/liter over a period of several days.

Many species in the harbor zooplankton are found in low abundance and occur only during short periods of the year. Stress or reduction of planktonic larval forms of benthic, intertidal, and pelagic organisms can affect future adult invertebrate populations in the harbor possibly beyond the duration of dredge-and-fill activities. Because the recolonization of the dredged area would be from larval forms settling out of the water column, impacts on speciation and abundance of zooplankton could affect the rates of benthic recruitment and repopulation of animals.

Table 4.2.15-2 - Biological Response to Sediment Disturbance

Common Name	Turbidity Level	Type of Sediment	Duration	Results
Oyster larvae	1.0 g/liter	Silt	Larval development (several days)	Only 3% developed normally
Oyster larvae	0.75 g/liter	Silt	Larval development (several days)	Growth reduced
Oyster larvae	3.0 g/liter	Silt	Larval development (several days)	All larvae died
Copepods	250 mg/liter	Mixture of silicon dioxide, diatomaceous earth, and silt	12-48 hr	Reduced ingestion rate
Phytoplankton	100-500 mg/liter	Silicon dioxide	12-48 hr	Reduced carbon uptake
Striped bass	1-9.9 g/liter	Diatomaceous earth	24 hours	LC_{10}
Shiner perch, white seaperch, striped bass, Pacific tomcod, brown rockfish, rubberlip surfperch	Above 500 JTU	San Francisco Bay sediments	Up to 42 days	Adverse effects on viability, e.g., mortality and weight loss
Eggs of striped bass	Up to 500 mg/liter	Chesapeake Bay sediments	Several days	Little effect on hatching success
Striped bass eggs	1,500 mg/liter	Chesapeake Bay sediments	Several days	Development rate slower, hatching unaffected

Table 4.2.15-2 (Contd)

Common Name	Turbidity Level	Type of Sediment	Duration	Results
Slipper limpet	Field studies higher concentrations	Sediment	Unknown	Significant decrease in growth rate
Slipper limpet	0.14-0.20 g/liter	Silt	Unknown	Depressed filtration rate
Hard clam	Various	Coarse sand	30 minutes	3.4 expulsions of pseudofeces per minute
		Fine sand	30 minutes	9.5 expulsions of pseudofeces per minute
		Mud	30 minutes	53.4 expulsions of pseudofeces per minute
Scallop, quahog (hard clam)	0.5 g/liter	Kaolin	Unknown	Increased mucous secretion and reduced filtration rate
Oysters	Suspended directly in discharge	Natural sediment	Unknown	No mortality
Oysters	Suspended from dredge and barge	Natural sediment	1.2 months	5% mortality
			4.0 months	27% mortality survivors in excellent condition

Table 4.2.15-2 (Contd)

Common Name	Turbidity Level	Type of Sediment	Duration	Results
Oysters	Unknown but high in summer months	Natural sediment	Summer spawning season	Rapid deposition prevents settling of larvae
Oysters	Held at dredge site in cages from 1 ft below surface to 1 ft above bottom	Natural sediment	2 months	Effects negligible, no effect on growth, mortality only at bottom where silt covered
Channel catfish and striped bass	Unmeasured - fish kept in cages in the disposal and control areas	Chesapeake Bay disposal sediments	Up to 60 days	No significant difference in mortality
Rainbow trout	$\geq$270 ppm	Kaolin and diatomaceous earth	2-6 months	Harmful - mortality and diseased fins
	$\geq$90 ppm	Kaolin and diatomaceous earth	+5 months	Thickened gills on some fish
Pink salmon fry	1% and 5% by weight	Olympia Harbor, Washington-bottom sediments	48 hours	No harmful effects
Striped bass	Up to 500 mg/liter	Fine grained natural sediment	Several days	No statistically significant effect on hatching success
	Secchi disk, 1-2 meters	Natural turbidity	Constant	10%-20% have injuries presumed to be from predators

Table 4.2.15-2 (Contd)

Common Name	Turbidity Level	Type of Sediment	Duration	Results
Rainbow trout	270 ppm	Diatomaceous earth	121 days	Fin rot disease
	Control	Diatomaceous earth	121 days	Unaffected
American oyster	0.1 g/liter	Natural silt	Less than 48 hours	57% reduction in pumping rate
	4 g/liter	Natural silt	Less than 48 hours	94% reduction in pumping rate
Oyster	Zero	Natural or artificial	Indefinite	Starvation
	0-100 mg/liter	Natural or artificial	Indefinite	Stimulated to feeding
	$\geq$100 mg/liter	Natural or artificial	Indefinite	Impairment of respiration and feeding
	3,000 mg/liter	Natural or artificial	Days or weeks	Mortality
Maine lobsters	47,000 ppm	Kaolin	4 days	No mortality
	1,600 ppm	Natural sediment	30 days	No mortality
	3,200 ppm	Natural sediment	3 days	No mortality
Shiner perch	$\leq$2 g/liter	Bentonite	10 days	LC_{50}

Table 4.2.15-2 (Contd)

Common Name	Turbidity Level	Type of Sediment	Duration	Results
Shiner perch	1.8 g/liter	Bentonite	10 days	LC_{20}
Shiner perch	0.5 g/liter	Bentonite	10 days	LC_{10}
Blue mussel	$\leq$60 g/liter	Bentonite	10 days	LC_{10}-LC_{50}
Sand shrimp	$\leq$60 g/liter	Bentonite	10 days	LC_{10}-LC_{50}

Source: COE-L.A. Harbor Department, 1980, pp. 146 to 148.

Decreased populations of zooplankton could have definite effects on other parts of the food web, particularly pelagic fish, which utilize the zooplankton as a primary food source. Schooling fish such as the northern anchovy require a density and composition of predominant zooplankton species that approaches baseline conditions for adequate feeding (COE-L.A. Harbor Department, 1980, p.60).

ii. Postconstruction. Impacts on zooplankton after completion of all dredge, fill, and dike activities would be related to decreased phytoplankton populations and/or water quality.

c. Benthic Communities.

i. Construction. Benthic organisms are affected in four primary ways from dredging and filling: habitat loss, feeding and filtering disruption from turbidity, physiological impacts of decreased DO, and impacts from exposure to contaminants associated with suspended sediments.

The primary impact to the benthic community (bottom and side-slope organisms) in the channel and berth areas would be the complete destruction of all organisms living in the surface sediments. This habitat area is equal to the 300-acre proposed dredge footprint extending from 3,000 ft south of Angel's Gate to 3,000 ft inside Angel's Gate and approximately 4,500 ft along the south side of the proposed landfill island for the berth area. The dredge channel width across Angel's Gate would be approximately 750 ft (top of slope) and 600 ft (toe of slope).

The assemblage of benthic organisms most likely affected outside the breakwater are dominated by the clams Macoma acolasta and Tellina modesta and the polychaetes Notomastus tenius and Prinonospio pygmaeus. Inside the breakwater north and east of Angel's Gate, the affected benthic asemblage is dominated by the polychaetes Tharyx parvus, Cossura candida, and Hapolscoloplos elongatus. In the dredge areas inside the breakwater, the number of individuals and number of species affected could approximate 211 and 55, respectively, per 0.11 yd^2 (MBC, 1984).

Turbidity and suspended sediments may affect the benthic organisms surrounding the dredging sites. High turbidity levels can exceed the filtering capacity of benthic feeders, resulting in clogging, disruption of feeding capacity, and burial. Laboratory bioassays have shown that bivalve filter feeders terminate feeding and/or respiration, carry out inefficient digestion and generation of pseudofeces, and experience reduced growth or death when exposed to suspended sediment concentrations of 0.14 g/liter (depressed filtration), 0.10 g/liter (impairment of respiration and feeding), and 3 g/liter (mortality) (Table 4.2.15-2). This response varies from species to species and is determined by particle concentration, size class, and phase of development in the life cycle. The resuspension of any contaminant associated with the dredge materials could affect the physiological processes of the benthic animals exposed to these constituents.

Dredge activities could produce turbidity plumes that impact benthic organisms outside of the immediate dredge area. The affected area would depend on transport by surface and water column transport forces. The affected area would most likely include the channel area north and south of Angel's Gate, as well as the outer harbor areas affected by the clockwise gyre. As the channels are deepened, bedload transport should be reduced because of decreased velocities.

Trophic impacts include the reduction of a viable food source for higher trophic level predators. Although recolonization of the area would occur (as discussed below in postconstruction), there would be a total loss of benthos in each section dredged. Because the dredging would be conducted over a 15-month period, some areas would begin recolonization while other areas are being dredged. Recolonization to predredging conditions of speciation and diversity could take 2 years or more (Reish, 1983). Thus, once dredging has begun on a channel or berth area, it would not regain its former value as a food source before all dredging has been completed.

Dike and fill activities would have similar water quality-turbidity effects on the benthos as described above. The primary dike and fill impact would be the significant loss of benthic habitat under the 208-acre footprint of the island, beach, and dike. The assemblage of organisms lost should be similar to the above discussion on dredging. Turbidity and suspended sediments could also affect the benthos in surrounding areas.

The total area of benthos affected by turbidity generated by diking and filling would relate to the patterns and magnitudes of bedload, water column, and surface transport mechanisms.

ii. Postconstruction. Completion of dredge activities would allow recolonization of bottom, side slope, and adjacent areas to begin. Recolonization would be initiated within 1 to 2 weeks after completion of dredging (Reish, 1983; 1985). Larvae, which were produced from organisms located outside the dredged area, would enter the affected area by the currents. Initially large numbers of larvae of different species would settle on the newly exposed subtidal sediments. The species composition would depend on what organisms are spawning at the time elsewhere in the harbor. Most of these newly settled larvae would be detrital or filter feeders. Recolonization of the sediment surface would depend on the rate at which sediment of appropriate size and texture is accumulated or settled on by organisms adapted to specific sediment grades. Other factors that influence the success and time frame for recolonization would include depth, nutrients, DO, and circulation.

The dominant species may change temporally and spatially depending on tolerance and adaptability to new biotic and abiotic conditions. The change to a coarser and possibly more compacted sediment regime may result in a change in diversity and abundance from existing baseline conditions (Reish, 1985). Availability of food and degree of predation are additional factors that would control speciation and diversity.

The new bottom and side slope areas would require 2 or more years to reach an established benthic community (Reish, 1983, 1985). After 2 years, the benthic community may be similar to what was present before dredging. Elimination of any contaminated surface sediment could possibly result in a higher diversity. The species composition on the new side slope may be different from the bottom community, depending on the nature and stability of the slope. The additional side slope would represent an increase in new benthic habitat of 1.4 acres inside the harbor and 1.1 acres outside the breakwater.

Recolonization back to baseline conditions in surrounding benthic areas affected by various levels of turbidity should be faster than 2 years. Slower flow velocities in dredged channel areas could cause slight changes in food availability for benthic animals. Isolated pockets of lower DO could occur in areas depressed below the main grade in channel bottoms (Reish, 1985). The filled and diked areas, unlike the dredged areas, would cause the loss of all benthic habitat covered by the dike (25 acres), beach (68 acres), and island (115 acres).

The organisms that successfully colonize the proposed beach slope may be more susceptible to scour at decreased depths by ships and currents. Increased scouring might be expected to change the composition of the slope benthos from relatively sedentary and tubiculous organisms to rapidly burrowing and shell-bearing organisms (Maurer, 1983). Rates of secondary production of burrowing amphipods and small bivalves are commonly higher than for fauna dominated by soft-bodied organisms (annelids). Gains from this possibly increased secondary production would have to be balanced against increased predation (Mauer, 1983).

d. Shoreline Communities.

i. Construction. The shoreline habitat that could be affected by dredge and fill activities is mostly limited to the riprap communities of the breakwater. Dredging impacts on intertidal rocky shore habitats may be minimal and limited to deposition of suspended sediments on attached or motile organisms and turbidity-related interference of settling organisms during their pelagic periods. Attached (sessile) forms such as Mytilus, Balanus, Obelia, and Clione typically utilize movement of water over their feeding surfaces to capture prey items; motile forms such as Crepidula rasp algae and newly attached meroplankton off the hard substratum. These strategies make organisms utilizing them susceptible to clogging of their feeding apparatus by resuspended particles. This can result in their diminished growth, activity, and reproduction or death from starvation.

Not all subtidal shoreline organisms are equally affected by sediment loads and siltation. Many animals adapt by burrowing, closing valves, avoidance, or developing a tolerance to sediment stress. The most critical period for benthic hard substratum organisms occurs during the summer months because recruitment from the plankton takes place at this time. The early development in the life cycle of marine organisms is considered to be the most critical with regard to the survival with environmental pressures (Hidu, 1965). Successful settling and metamorphosis require low environmental stress;

therefore, organisms at this stage of development would be most susceptible to any increased environmental stress as a result of turbidity. The summer period is also naturally characterized by higher water temperature and lower DO, which may act synergistically with turbidity to increase stress.

Many of the intertidal organisms such as Mytilus are attached to the substratum and are dependent on filter feeding in the circulating water column. Increased turbidity or suspended solids affects filter feeders by clogging the gills and irritating the tissues.

Growth was inhibited in the quahog, Mercenaria mercenaria, when subjected to a suspension of fine silt-clay sediments. This occurred in part from feeding interruption, as well as increased energy requirements to clean the filtering apparatus. The scallop, Placopecten magellanicus, produced increased amounts of mucus in cleaning the gills of a kaoline suspension. Some bivalves also cope with increased turbidity levels by an increase in the expulsion rate of pseudofeces. The pumping rates for oysters reduced 57% in silt suspensions of 0.1 g/liter and 94% in silt suspension of 4 g/liter. If pumping rates are held to a low level for long periods of time, suffocation or starvation is possible. In contrast, small quantities of silt sometimes stimulated normal activities of adult and larval oysters, and the pumping rate of Mytilus edulis accelerated with increased concentrations of suspended bentonite clay above 1 g/liter. M. edulis can undergo a loss of byssal threads for attachment under conditions of suspended bentonite or low DO levels associated with turbidity increases.

The spatial and temporal breadth of impacts on intertidal habitat would depend on the extent and magnitude of the turbidity plume from dredging. Recovery rates would have a similar dependency.

Turbidity-related impacts on the breakwater shoreline community would be similar for the diking and filling activities. Harborwide impacts on other shoreline habitat during construction should be minimal because of long distances from the dredge and fill areas.

ii. Postconstruction. There would be no permanent loss of shoreline habitat from the dredge and fill components. The proposed dike on the south and east side of the landfill island would provide 19 acres of new rocky surface area (Pactex, 1985). The new riprap should incur colonization of species similar to the community on the harborside of the breakwater.

e. Fish and Ichthyoplankton.

i. Construction. Impacts on fish and ichthyoplankton from dredge activities would result from increased turbidity, decreased DO, change in pelagic and benthic habitat, and settling of suspended material.

Increases in turbidity in the immediate dredging area and in areas affected by the turbidity plume may cause abrasions on larval and adult finfish that can increase susceptibility to parasites and disease (COE, 1975; COE-L.A. Harbor Department, 1980, pp. 60, 67). Other effects include gill tissue disruption and gut packing with suspended solids (Sherk and O'Connor, 1975),

as well as excessive coating of gill material by suspended fine particles that cause decreased respiration or waste exchange and possible mortality (Sherk and O'Connor, 1975; Sherk et al., 1974).

Decreases in DO associated with oxygen demand of resuspended sediments can operate in an intricate synergistic fashion to impact adult and juvenile fish. Low oxygen levels have not only been shown to influence growth rate, food conversion efficiency, and feeding in some species but in the presence of some toxicants to enhance the lethal effects of those toxicants on certain species (Davis, 1975). Reduced oxygen concentrations below 5 mg/liter that produce metabolic stress could lower the ability of fishes to resist toxicants, as well as increase toxicant uptake rate via elevated ventilatory water flow. This process could become particularly acute during phases of both dredging and filling if toxicants are associated with the sediments and become resuspended in the water column. Species in lower trophic levels such as the northern anchovy and topsmelt with high DO requirements may experience the most lethal effects of lower DO (COE-L.A. Harbor Department, 1980, pp. 60, 67).

Fish eggs near hatching and larvae require high levels of DO (Davis, 1975). Decreases in DO could, therefore, impact hatching success and survival rate of larvae. DO impacts associated with increased turbidity could be exacerbated during periods of warmer water when DO is normally decreased. The reduction of light in the water column caused by increased turbidity can alter normal development times and hatching periods. Changes in developmental times could occur. A reduction in reproductive or developmental success could impact speciation and diversity of future harbor populations.

Juvenile and adult fish may actively avoid areas of increased turbidity and decreased DO (SCOSC, 1982). Eggs and larvae, having little or no power of independent movement, would be subject to greater mortality (SCOSC, 1982). Table 4.2.15-2 shows some biological responses of fish and invertebrate species to various types and levels of sediment disturbances. Impacts of various levels of turbidity ranged from slower development rate and no effect on hatching (1.5 g/liter), thickened gills (90 mg/liter), fin rot disease (270 mg/liter) and 10%, 20%, and 50% mortality (0.5 g/liter, 1.8 g/liter, and 2 g/liter, respectively).

During the 4- to 6-month dredge period outside the Angel's Gate and 15-month period inside the Angel's Gate, adult fish and juveniles with the ability to leave localized disturbance areas will seek suitable habitat. Temporary stress in localized areas from increased turbidity could be exacerbated by conditions of decreased DO, unavailability of suitable habitat, or increased pollutant levels.

Removal of 15 million yd^3 of sediment from the dredge footprint would cause the temporary loss of 300 acres of benthic habitat upon which fish species feed. Decrease in food resources of benthic invertebrates (as discussed) would cause bottom-feeding fish species to feed elsewhere inside or outside the harbor.

Affected fish will include species that feed and forage in outer harbor soft-bottom habitats.

Deposition of suspended sediments on rocky substrate such as the breakwater may cause loss of suitable foraging habitat through impacts on attached invertebrates (discussed above). Fish species utilizing rocky areas or other shoreline and benthic areas affected by sediment settling could be impacted by limited food. Appendix I (Table I.3-4) provides a summary of preferred habitat for some abundant harbor fish species. Species affected by loss of rocky habitat food sources and habitat could include black surfperch, rockfish, queenfish, shiner surfperch, speckled midshipman, barred sand bass, walleye surfperch, and kelp bass. Species affected by loss of benthic soft-bottom (sandy) foraging areas could include speckled sanddab, California tonguefish, queenfish, white surfperch, bay goby, callico rockfish, California halibut, California corbina, and jacksmelt.

Dredging activities would also impact fish species that use visual orientation to feed in the water column (COE-L.A. Harbor Department, 1980, pp. 60, 67). Affected species would include northern anchovy, Pacific bonita, jack mackerel, and Pacific butterfish.

Impacts on fish eggs and larvae associated directly with the substrate will include mortality caused by smothering. The spatial and temporal magnitude of the impact is difficult to assess because of the lack of specific data on spawning and nursery use of proposed dredge areas. Impacts on larvae could be greater inside the breakwater because of the nursery function of the harbor. Adult demersal fish could also be smothered during dredging. These include flatfish, gobies, and midshipmen (SCOSC, 1982).

Impacts on fish eggs, larvae, juveniles, and adults during filling and diking activities would be similar to those discussed above for dredging. The loss of the benthic area for habitat and feeding would gradually approach the 208-acre fill footprint over a 15-month period. Disposal of dredge material at or near the surface of the water column could cause greater impacts on ichthyofauna than dredging at the disposal site (SCOSC, 1982). The pelagic habitat would be obliterated in the area of spoil disposal. The underlying benthic area would gradually be destroyed. The spatial and temporal magnitude of the filling impact on areas beyond the fill footprint is difficult to assess without full knowledge of the extent and duration of the turbidity plume.

ii. Postconstruction. After completion of dredging activities, turbidity levels would return to normal baseline conditions. The quality of new benthic side slope and bottom areas as habitat and food sources for demersal and pelagic fish would depend on rates of benthic recolonization, sediment stability, and sediment regime. Recolonization to former conditions of biomass and speciation could take 2 or more years as discussed above. The return of fish populations to former levels in the area of the dredge channels and berth could therefore take an equivalent period of time (SCOSC, 1982).

Impacts on the northern anchovy population in the harbor would relate to a decrease in the zooplankton food supply caused by turbidity. There will be no long-term impacts to the central California anchovy population. There could be a short- and possibly long-term decrease in local availability of anchovy for the sport and bait fisheries in the harbor (Klingbeil, 1985).

Benthic, rocky, and shoreline areas that experience deposition of suspended sediments would incur recolonization of invertebrates. Return to baseline conditions of biomass and speciation should foster utility as viable feeding habitat. The time frame would depend on the amount of deposition incurred during dredging, impacts on planktonic populations of settling organisms during dredge-and-fill activities, and rates of recolonization.

After full recolonization of all impacted areas, there should be no net long-term loss of demersal fishery habitat from dredge activities. There would be a net gain of 1.4 acres inside the breakwater and 1.1 acres outside the breakwater of benthic side slope that should colonize with typical fauna.

Table I.4-1 shows the habitat change for the Pactex project and two alternatives from dredge-and-fill components. There is a significant net loss of 208 acres of deep benthic soft-bottom habitat from the fill component. There is a net gain of 19 acres of rocky habitat.

These habitat changes could foster an increase in the diversity and abundance in outer harbor fish, which utilize rocky, shallow soft-bottom and shoreline habitat, and a localized decrease in fish associated with deep soft-bottom habitat. This new substrate should yield a typical rocky shore community. The food supply would be different from that of the soft-bottom, preventing some species of previously displaced fish from using the newly created habitat.

The utility of the new habitat areas would depend on food availability, substrate composition, and degree of protection from sea conditions and vessel disturbance.

f. Marine Mammals and Sea Turtles: Construction and Postconstruction. Direct impacts to marine mammals and sea turtles from dredge and fill activities would be minimal. In the event of a visit to the harbor during construction, these animals are capable of avoiding construction equipment and turbidity plumes.

Minor impacts on food availability for these animals may occur with the possible decrease of invertebrates and fish populations discussed above. Most of the resident and transient fish species can serve as food for marine mammals (see Appendix I, Table I.3-7). In the event that fish species ingest suspended material with constituent contaminants, there could be concentration of these contaminants in the higher trophic level of marine mammals. This is a potential but very low probability impact.

There will be no long-term impact on marine mammal and sea turtle habitat because the harbor is not considered a normal feeding, spawning, or nursery habitat.

g. Avifauna.

i. Construction. The occurrence of localized or widespread turbid surface waters would interfere with visual feeding by diving birds. Turbidity-related decreases in fish and invertebrates could decrease utility of feeding habitat in affected areas. There would be minimal loss of resting habitat in the outer harbor as open water areas are suboptimal habitat because of lack of shelter from wind (Weinstein, 1985). There would be no enhancement of feeding habitat in relation to dredging (Fancher, 1985). A short-term positive impact associated with the landfill may be the increased availability of dredged benthic fauna placed on the landfill island. Large numbers of seabirds (gulls and terns) are expected to feed on the landfill during construction if the spoil contains benthic fauna (COE-L.A. Harbor Department, 1980, p. 71).

The occurrence of turbid waters in shallow water foraging habitats of the endangered least tern could decrease the utility of the habitat. Disruption of feeding during the breeding season from dredge and/or fill-related turbidity could have an effect on the breeding success and future population levels.

ii. Postconstruction. Avifauna could be impacted by decreases in food availability of fish and invertebrates caused by the dredge-and-fill activities. The loss of open water habitat could be balanced by the gain of shallow water and rocky feeding areas (beach and dike components) and resting areas (all components).

Impacts to the two endangered species, the brown pelican and California least tern, would be limited to a decrease of food resources. Neither species would experience long-term impacts to breeding or foraging habitats. Both would be affected by a decrease in fish populations. The least tern is known to eat northern anchovy, topsmelt, mosquito fish, and various surfperch.

The beach area on the north and west sides of the island could become a temporary foraging area for the shallow-water feeders.

6. Submarine Pipeline. There will be no short- or long-term impact on, or changes to, the physical oceanography of the harbor from the dredging, burial, or covering of the submarine pipeline, which would extend from the proposed landfill island north across the Seaplane Anchorage.

There will be localized and possibly significant turbidity increases and DO and transparency decreases during the 6- to 8-week period required to dredge the pipeline route.

Trench construction and backfilling by clamshell dredge would take place after all dredging and island filling are complete (Pactex, 1985). This should reduce synergistic water quality impacts. Water quality impacts from the pipeline dredging and backfilling would be similar to, but of shorter duration than, those discussed for the channel and berth dredging. Significant increases in turbidity and settleable solids could exceed the

RWQCB standard of 1 mg/liter/h for return water in the shallow water area adjacent to the Seaplane Anchorage caused by reduced settling volume (Schinazi, 1985).

The change in sediment regime along the entire harbor pipeline route would be minimal as existing material would be used for trench backfill (Pactex, 1985). There would be changes in surface sediments with loss of finer particles and a resulting higher percentage of sand.

Pipeline dredging and backfilling would cause localized loss of all benthic animals in the dredge channel and adjacent area of temporary fill placement. The impacted area (30 ft wide and 8,000 ft long) would amount to 5.51 acres.

The dominant benthic species most likely to be affected along the pipeline route in the harbor include the polychaetes Spiophanes missionensis, Prionospio pygmaeus, Mediomastus ambiseta, Haploscoloplos elogatus, and Cossura candida as well as the amphipods Amphdeutopus oculatus, and Ampelisca cristata. In the Cerritos Channel, it would be the polychaetes Cossura candida, Mediomastus californiensis, and Tharyx parvus. A recolonization time of 2 years to return to baseline conditions could apply to the 30-ft-wide trench area. Speciation and diversity may be altered from present baseline conditions as discussed below for channel dredge and island fill components.

The habitat loss and food supply losses for fish would be similar but of less magnitude to that discussed above for channel dredging and island filling. Pelagic species would return to the area of trenching after backfilling is completed. Benthic feeders and/or inhabitants would return when substrate and food supply approach suitable carrying capacity. The utility of the 30-ft-wide affected area as a food supply could take 2 years or more to return to baseline conditions as discussed above.

Fish species affected temporarily by the trenching in the Seaplane Anchorage area may include juvenile and adult California halibut, California corbina, white croaker, queenfish, white seabass, spotfin croaker, yellowfin croaker, and gobiid larvae (SCOSC, 1982). Pelagic fish species will tend to avoid the area affected by dredge and backfill activities.

Dominant fish species affected temporarily by construction in the Cerritos Channel could include queenfish, white croaker, and shiner surfperch (MBC, 1980).

Pipeline construction activities of dredging and backfilling could significantly disrupt feeding and foraging activity of the least tern in shallow water habitat adjacent to the 190-acre landfill. The disruption could last a minimum of 6-8 weeks during pipeline construction if construction occurs during the April to September breeding season.

B. Structural Island Components

1. Construction. Structural island components with implications for marine impacts would be associated with the two fixed berths on the south side of the landfill island. Construction impacts would be limited to the sinking of an estimated 170 steel piles (54 in.) and 48 concrete piles (24 in.) for the dolphins (mooring and breasting) and the supply wharf. Impacts would be limited to turbidity generated by the sinking of the piles to 60 ft below the mud line. There should be minimal loss of benthic animals because the berth area would have been recently dredged.

2. Postconstruction. The berthing area with its associated dolphins and wharf on piles could cause changes in flushing and water flow adjacent to the island and between the south face of the proposed landfill island and the breakwater. Piles could provide additional habitat for settling and fouling organisms, as well as for fish that utilize the piles as a habitat. Table I.4 shows that the piles would provide additional habitat of 3 acres.

C. Liquid Effluent and Scrubber Intake-Outfall

1. Ship-Barge Effluents. All liquid tanker wastes would be disposed of, or processed, in accordance with the USCG, POLA, and RWQCB laws. There would be no generation or disposal of foul ballast from Pactex offloading tankers. All liquid cargo residue would be processed and discharged in a licensed maintenance yard. There would be no tank washing or discharge of effluent because there would be no mixed cargo on Pactex tankers. Barges that carry sewage from the proposed landfill island would not dispose of this effluent in the harbor (Pactex 1985).

The scrubber waste discharged from the inert gas system (IGS) on tankers could require a point source discharge permit from the RWQCB (Schinazi, 1985). The discharge could be required to meet standards necessary to maintain the beneficial uses of the harbor waters.

In the flue gas scrubbing process, sulfur oxides and particulate matter are removed from the boiler gas with seawater. The seawater effluent from the scrubber has a substantially lower pH (range of 2 to 4) (Rickleff and Sandell, 1977) than the influent seawater (range 7.3 to 8.7) (HEP, 1976). Table 4.2.15-3 shows that ambient pH ranges were maintained at all stations from surface to -40 ft MLLW and adjacent to the discharge (station A) 15 ft away (stations B, C, D, E, F), 50 ft away (stations G, H, J) 100 ft (stations K, N), and at control stations L and M (1,000 ft).

The buffering and dilution capacity of the harbor receiving waters would limit pH increases to 0.3 pH unit for IGS effluents with a pH range of 2 to 3 discharged at rates between 445 and 1,250 gpm (Table 4.2.15-3) (Rickleff and Sandell, 1977). This increase was observed for the IGS scrubber systems used at berth for tankers in the 120,000- to 150,000-dwt class (Table 4.2.15-3), offloading crude oil at rates at 15,000 to 30,000 bph (Rickleff and Sandell, 1977).

Table 4.2.15-3 - Results of IGS Scrubber Effluent Surveys

Ship	dwt (10^3)	Offloading Rate of Cargo (bbl/hr)	Scrubber Discharge (gal/min)	Sulfur Content of Fuel (%)	pH	Depth (ft)	pH Stations[a] A	B	C	D	E	F	G	H	I	J	K	N	Control L	M
Arco Independence	152	15,000	1,250	0.2-0.5	-	0	7.8	8.0	7.9	7.7	7.7	7.8	-	8.0	-	8.0	8.0	-	8.0	8.0
						10	8.0	8.0	7.9	7.9	8.0	8.0	-	8.0	-	8.0	8.0	-	-	-
						20	8.0	-	-	-	8.0	8.0	-	-	-	-	-	-	-	-
Susanne Onstad	176	15,000	445	3.0-4.0	2.8	0	7.8	7.6	7.7	7.7	7.7	7.7	7.6	7.7	7.5	7.7	-	-	7.7	7.7
						10	7.7	7.6	7.8	7.7	7.7	7.7	-	-	7.6	-	-	-	-	-
						40	7.8	7.7	7.8	7.7	7.7	7.8	-	-	7.7	-	-	-	-	-
Amoco Trinidad	149	20,000	1,042	1.5-3.0	-	0	7.8	7.8	7.8	7.8	7.8	7.9	7.8	7.7	-	7.9	-	-	7.8	-
						10	7.8	7.9	7.8	7.8	7.8	7.9	7.8	7.8	-	-	-	-	-	-
						20	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-
Aegean Sun	122	30,000	990	2.0	3.6	0	7.8	-	-	-	7.8	7.8	-	-	-	7.8	-	-	-	7.8
						10	7.8	-	-	-	-	-	-	-	-	-	-	-	-	-
Susanne Onstad	-	24,000	445	3.0-4.0	3-1	0	7.7	7.9	8.0	7.9	8.0	7.9	8.0	8.0	7.9	8.0	-	8.0	8.0	8.0
						10	7.8	7.9	8.0	8.0	8.0	8.0	7.9	8.0	8.0	8.0	-	-	-	-
						20	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-

- = no sample.

[a]Station A was directly above the discharge while Stations B, C, D, E, F, were on a semicircle with a radius of 15 ft whose center was Station A. Stations B and F were astern of Station A. Stations G, H, and J were 50 ft from Station A. Station I was 30 ft astern of Station A. Stations K and N were 100 ft from Station A. Control Stations L and M were 1,000 ft forward and astern, respectively. Stations J and K were always located downcurrent of Station A.

Assumptions made during study:

(1) The inert gas system in operation at all times when pH measurements taken.
(2) Scrubber working at maximum efficiency during operation.
(3) No correlation between effluent pH and % efficiency of scrubber portion of IGS.
(4) Control Stations L and M were representative of ambient conditions.
(5) The inert gas system scrubber only factor influencing pH of discharge water.
(6) Samples of effluent obtained inside ship were representative of the discharge as it exited the ship.
(7) The discharge opening was a round hole in hull; discharge exhibited normal flow characteristics as it passed through the opening.
(8) Surface manifestation of discharge indicative of primary direction of flow.

Source: Rickleff and Sandell, 1977.

Impact on finfish should be minimal because fish would tend to avoid a gradient of decreasing pH. Larval and planktonic forms that lack independent mobility could be physiologically damaged in the immediate area of the discharge.

The effluent seawater would also contain suspended and dissolved solids derived from the flyash-particulate matter. Components could include hydrocarbons and metal constituents. The discharge of this material would require permit approval from the RWQCB.

2. Proposed Landfill Island Effluents. There would be a point source discharge of runoff water and water from the oil/water separator into the harbor. This discharge would be regulated by permit requirements and standards set by the RWQCB. Requirements would be established to prevent significant impacts on the beneficial uses of the harbor waters including navigation, industrial water supply, noncontact recreation, commercial and sport fishing, marine habitat, and rare and endangered species habitat. Standards would be designated for settleable solids, DO, temperature, oil and grease, odors, toxics, and visible materials (Schinazi, 1985; RWQCB, 1975).

3. Scrubber Intake. The positioning of the scrubber intake pipe at -20 ft MLLW, with an expected intake velocity of 0.5 ft/sec and a flow rate of (14,000 gpm x 14 hours/day) 11.76 mgd (Pactex, 1985), would not impact the water quality of the harbor. The system would be required to meet the 316-B requirements of the Federal Water Pollution Control Act that the location, design, construction, and capacity of the intake reflect the best available technology for minimizing adverse environmental impact (FWPCA, 1976). Potential significant impacts would include impingement, stress, and mortality to pelagic marine animals.

Phytoplankton and zooplankton would have no ability to avoid being sucked through the intake because of their lack of active mobility. The numbers of individuals entrained would be expected to be less than the concentrations in the surrounding waters. Entrainment would be expected to cause mortality.

Observation of an existing intake in the west basin indicated that planktonic invertebrates made up 57.8% by wet weight of total material entrained (Dames & Moore, 1979), which comprised hydroids, tunicates, and an assortment of shrimp, caprellid amphipods, and algal at 35.3%, 21.8%, and 7.4%, respectively.

Potential impacts to fish have been the subject of several studies (Dames & Moore, 1979; Woodward-Clyde Consultants, 1981). Proper design and use of a seal guard for large debris and a trash screen for small debris, positioned at an experimentally determined angle, achieved 100% bypass of fish in the range of 1 in. to 6 in. for a significantly smaller system than the proposed Pactex system (Woodward-Clyde Consultants, 1981).

The impingement of fish at the Union Oil intake with intake flow of 19,400 gpm and velocity of 0.78 ft/sec (Dames & Moore, 1979) (comparable to the 14,000 gpm and velocity of 0.5 ft/sec for the proposed landfill island system) was primarily of six dominant species: white croaker, shiner

surfperch, trident goby (Tridentiger trigonocephalus), yellowfin goby (Acanthogobius flavimanus), northern anchovy, and queenfish. White croaker made up 66.4% of all fish impinged. The total fish impingement rate was 0.09 lb/hr; an annual rate of 778 lb. This was estimated as 0.02% to 0.05% of fish standing stock or 0.04% to 0.09% of total fish production in the harbor (Dames & Moore, 1979). Of the dominant species impinged, average size was 2.85 in. and the average number per hour was 140. Fish made up 23.99% of the total wet weight of material impinged.

The proposed system's basic design would be similar to systems already in use in the harbor. Impacts on marine biology would be similar to those discussed above and could be significant.

Maintenance of the proposed intake should be accomplished by semiannual physical cleaning. Chemicals that could impact water quality would only be used if necessary and would be regulated by the RWQCB.

4. Scrubber Outfall. The water discharged through the scrubber outfall at elevation -35 ft MLLW would require a point source discharge permit from the RWQCB (Schinazi, 1985). The discharge would be required to meet standards necessary to maintain the beneficial uses of the harbor waters.

In the flue gas scrubbing process, sulfur oxides and particulate matter are removed from the gas with seawater. The seawater effluent from the scrubber has different characteristics from influent water. The Pactex scrubber system would discharge seawater at 3.3°F above the natural receiving water temperature (Pactex, 1985). This discharge would comply with the standard established by the SWRCB that new elevated temperature waste discharges would not result in increases in the natural water temperature exceeding 4°F (SWRCB, 1976).

The pH of the effluent would be 7.5 (Pactex, 1985) and would not alter the ambient pH range of 7.3 to 8.7 (HEP, 1976). There would be no pH impact on the marine environment from this effluent.

The effluent seawater would contain suspended and dissolved solids derived from the flyash-particulate matter. A total of 13.28 lb/hr of particulates would be disposed of in the effluent (6.64 lb/unit x 2 units). The discharge of this material would require permit approval from the RWQCB.

D. Staging Area

There would be no significant impacts on the oceanography and marine biology of the harbors from use of the 40-acre area on the 190-acre landfill. All sewage, runoff, and solid waste would be disposed of in accordance with existing statutes. The area will be within 350 ft of a designated least tern nesting site. There should be no impact on least tern foraging or breeding success.

E. Vessel Traffic

The proposed Pactex facility would be used by less than two ships per day (up

to 408 vessels per year) under the present proposal (Pactex, 1985). This increase in vessel traffic would not cause impacts to the oceanography and marine biology of the harbor because of wave action or effluents. The risk of oil spills, a potential impact of increased tanker traffic, is discussed in subsection 4.2.17.

F. Oil Spill Impact Assessment

Risk and probability of a spill event in the harbor are discussed in subsection 4.2.17. The impact assessment for spills in the marine environment presented here is limited to spills occurring from a vessel traffic accident or pipeline rupture within the harbor. The assumption is made that:

(1) Small chronic spills that may occur inside a tanker berth would be contained by a protective, heavy-duty boom and cleaned up according to USCG and POLA requirements (USCG Marine Safety Office, 1985).

(2) Any rupture of a storage tank on the proposed landfill island would be completely contained by the dike system around the tanks (Pactex, 1985).

Oil spilled on the island would be processed through the oil/water separator. Subsequent point-source discharges through the separator would meet all standards imposed by the RWQCB.

A pipeline rupture between any two check valves in the harbor could result in the release of up to 276,840 gallons of oil in the sediments and water column along the route from the island, north through the Seaplane Anchorage (subsection 4.2.17). A vessel accident could result in release of up to the full cargo volume of 65.1 million gallons. Either of these spill events would be considered major spills with potential for significant impacts of long-term persistence in the marine environment and long-term changes in the speciation, diversity, and carrying capacity of affected marine habitats. The cleanup of spills of this size would take a minimum of weeks to a maximum of months. A recent harbor spill of 1.26 million gallons from the explosion of the vessel Sansinena took 14 months for removal and cleanup (USCG Marine Safety Office, 1985).

Two worst-case oil spill scenarios are used to discuss the potential impacts to the marine environment:

- Scenario I is a vessel accident that discharges 65.1 million gallons north of Angel's Gate in the center of the Main Channel. This scenario would result in slick movement north and south across Angel's Gate, depending on tidal stage. Likely areas for impact, negating transport by wind forces, would include the north and south sides of the breakwater around Angel's Gate, the west and north sides of the landfill island beach area, the water column between Angel's Gate north to Terminal Island and Reservation Point, and the marine structures in the fish harbor, Reservation Point, and the Main Channel.

- Scenario II is a pipeline rupture north of the proposed landfill island and south of the Seaplane Anchorage. This scenario would result in very slow slick movement in relation to tidal currents generally less than 0.25 ft/sec as shown in Figures 3.2.15-2 through -4. Likely areas of impact, negating transport by wind forces, would include the north side of the proposed landfill island, the shallow water habitat adjacent to the 190-acre landfill, the south side of the Navy Mole, and the bulkhead around Terminal Island. A significant amount of the oil from a pipeline rupture could become directly incorporated into the sediment.

1. Water Quality. Oil spills interact with the water column by dissolution, emulsification, photochemical oxidation, and resuspension from the sediments. Short-term impacts would include a decrease in available light and transparency and an increase in concentration of the toxic petroleum hydrocarbon (PHC) constituents. During slick transport and weathering, soluble aromatic hydrocarbons and their derivatives become incorporated into the water column. Soluble napthalenes appear to be the highest in toxicity. Lower molecular weight paraffinic hydrocarbons are less soluble but also significantly toxic to marine life. As weathering of crude occurs, evaporation and dissolution would decrease the amount of soluble components and the toxicity of the slick.

Water quality may continue to be degraded by:

(1) Oil that chronically leaches soluble components into the water column from oil-contaminated sediments.

(2) Oil stranded on marine structures and intertidal sandy areas.

The impacts of a spill on water quality would be more critical during periods of naturally depressed DO or conditions of fast movement and mixing time.

2. Phytoplankton. In situ and in vitro observations of effects of oil on phytoplankton provide conflicting results. Phytoplankton sensitivity to oil results in delayed cell division (0.01 to 1,000 ppm) and mortality (0.1 to 1,000 ppm). Differences in sensitivity occur between species and are evident with variations in ambient conditions of available light, sea temperature, DO, and turbulence.

Phytoplankton lack independent mobility and are subject to impacts from direct contact with a spill or contact with dissolved toxic constituents. The concentration of crude oil in seawater necessary to cause a specific degree of photosynthetic inhibition apparently changes seasonally, depending on the physical and chemical factors and on the species composition and relative abundances. At low concentrations of 10 to 30 ppb, photosynthesis may be stimulated. Temperature effects are varied; a maximum rate of photosynthesis for oil-treated phytoplankton may occur between 50°F to 59°F. At high natural light levels, photosynthesis may be reduced by 65% with simultaneous exposure to 5.5 ppm crude. Reduction of light to one-fourth exposure could result in only a 20% reduction.

The relative species composition in a natural phytoplankton population may be altered by crude oil, resulting in a decrease in the abundance of some species and an increase in others. The effect depends on the amount and type of oil present.

In the event of a spill in the harbor, localized reduction of abundance and diversity could occur. The impact should be short term. Spatial and temporal aspects of the impact would depend on the size of the affected area and whether chronic resuspension of oil occurs from oil stranded in sandy or shoreline areas.

There would be a similar magnitude of impacts for Scenario I and II spills. Scenario I could be more toxic to phytoplankton because the spill would undergo more dissolution of toxic components at the surface.

3. Zooplankton. Zooplankton rapidly ingest various PHC fractions in seawater. Crustaceans tend to metabolize the PHC, but coelenterates do not. Incorporation of PHC is followed by varied amounts and rates of depuration.

Several studies have demonstrated the presence of considerable quantities of oil in the guts of copepods and arthropod larvae (barnacles) and in their fecal pellets. Grazing by other zooplankton and by higher trophic levels (fish) may have implications for food chain amplification of PHC. Contaminated fecal pellets may be incorporated into the sediments or eaten by other organisms.

Direct mortality of zooplankton organisms in the surface layer could result from an oil spill. Feeding interference would also occur with a probable reduction in feeding rates. Contact with a spill and/or dissolved PHC fractions can affect zooplankton populations by covering eggs and reducing or impairing larval development. The ability to molt through various stages could be impaired.

Stress or reduction of zooplankton, including larval forms of benthic or settling organisms, could affect future populations. Decreased populations can affect higher trophic levels that use zooplankton or depurated material as a food source. Important schooling fish such as the northern anchovy require a density and composition of zooplankton species that approaches baseline conditions for adequate feeding.

The impact of a spill event on zooplankton in the harbor could have long-term effects on benthic and fouling populations that are recolonized by their planktonic stages and other trophic levels that graze the plankton. A spill event could have short-term impacts on speciation and diversity of benthic and fouling populations when zooplankton populations with short-term residence in the harbor are affected.

4. Benthic Communities. Benthic communities are exposed to oil that has directly sunk or has adhered to particulate matter and then sunk to the bottom. Subtidal soft bottoms and algal beds are perhaps less threatened by oil than coastal shoreline habitats, but they are likely to incur long-term damage once impacted. Oil persists the longest in deeper, unconsolidated soft bottom areas.

The danger of a spill to benthic organisms relates to:

(1) Direct mortality caused by smothering, asphyxiation, and fouling resulting from direct contact with oil.

(2) Indirect mortality caused by death of food sources (plankton) or destruction/removal of habitat.

(3) Destruction of juvenile and larval forms.

(4) Incorporation of sublethal amounts of petroleum fractions into body tissues with implications for lowered tolerance to stress and food chain amplification (Zieman et al., 1984).

Benthic communities are most threatened by contact with the aromatic hydrocarbons, especially napthalene (Zieman et al., 1984).

Oil spills may impact benthic communities by changing the chemical and physical properties of the sediments. One effect is the reduction of bottom sediment cohesion by killing the benthic flora and fauna. The resulting erosion can spread PHC to wider areas where the process is repeated. Degradation of the PHC associated with the sediments is limited to the surface layer of the bottom where slow microbial processes occur. The persistence of petroleum hydrocarbons in the benthic sediments is related to biological, physical, and chemical processes of uptake and degradation.

The literature on oil spill impacts fails to quantify specific temporal and spatial impacts of oil spills on benthic communities. The specific impacts of crude oil spills on the benthos are poorly documented compared to spills of lighter grade fuels. After a spill of No. 2 fuel oil near Falmouth, Massachusetts, immediate and nearly complete mortality of many forms of benthos occurred (Sanders et al., 1972). The bivalve mollusks were especially vulnerable. During the 20 months following the spill, sensitive ampeliscid amphipods did not recolonize, and opportunistic species, particularly the marine polychaete Capitella capitata, recolonized the affected areas as soon as hydrocarbon concentrations reached a certain reduced level.

Both laboratory and in situ observations have shown various levels of uptake and depuration of hydrocarbons in bivalve mollusks. The occurrence of food chain amplification of hydrocarbons is still a disputed issue.

Adult subtidal organisms are generally less susceptible to direct impacts from oil than intertidal organisms. Some species of bivalves (Mercenaria), coelenterates (Anthopleura), and polychaetes (Capitella) are very tolerant of crude oil. Other species are destroyed at concentrations as low as 1 ppm. The direct impacts of oil spills on subtidal filter feeders generally decrease with increasing depth. Detrital feeders may be impacted more than filter feeders because of their potential for direct ingestion of contaminated food materials.

Impacts on benthic algal beds relate to damage or to mortality of the algal species and/or the associated faunal assemblage. High toxicity components (aromatic hydrocarbons) and direct smothering present the greatest threat to the integrity of these communities (Zieman et al., 1984).

The most serious known effects on algal beds have been observed on communities that are intertidal or marginally subtidal and subject to occasional exposure. Algal beds in the Main Channel and the kelp beds adjacent to the breakwater are very vulnerable but minimally susceptible to the impacts of an oil spill. The impact of a spill on the Main Channel beds would include decreased speciation and diversity with possible long-term reduction in productivity. The kelp bed is less susceptible to a spill. Probable impacts of a spill that reaches the kelp would be a short-term reduction in the speciation and diversity of the associated faunal assemblage.

The benthic communities of the harbor could be impacted to a greater extent by a Scenario II oil spill. This type of spill could result in the direct incorporation of crude oil in the surrounding sediments. The benthos in the affected area would be completely smothered by the spill. The persistence of this type of spill in the sediment would be long term. A Scenario I spill would affect the benthic habitat only through sinking of the oil from the surface. Outer harbor areas would be less impacted than inner harbor-shallow areas.

Table 4.2.15-4 shows that soft bottom benthic habitat can suffer moderate to high damage from a spill. Recovery is long term with low inertia to return to baseline conditions. An algal bed (seagrass) has high ability (inertia) to recover from a spill, although recovery periods can be short term or long term (up to 50 years).

5. Shoreline Communities. The potential for oil spill impacts on the marine shoreline communities is high because of the ability of oil to strand and persist on rocky and piling areas and in the sediments of sandy intertidal areas. Impacts are similar to those discussed for the benthos and include:

(1) Direct mortality from smothering.

(2) Decrease of food sources and populations of settling organisms.

(3) Incorporation of sublethal amounts of petroleum fractions into body tissues.

Direct mortality from smothering has been observed as the principal impact of spills on intertidal organisms, including the barnacles Chthamalus, Balanus, the mussel Mytilus, the echinoderm Pisaster, and univalve mollusks. Rocky intertidal organisms show considerable tolerance to oil pollution and are considered less vulnerable to spills than organisms in sandy beach habitat. The impact is increased on sandy intertidal or tidal flats by the persistence of oil in unconsolidated substrates. Infaunal

Table 4.2.15-4 - Summary of Importance, Vulnerability, and Recovery Potential of Marine Ecosystems Impacted by Oil

Habitat	Importance (if known)	Vulnerability to Oil Spill Damage	Ecosystem Inertia	Natural Recovery Period (in years)
Intertidal Shore	Bird feeding and nesting			
Sandy beach		Moderate	Low	0.5-4
Rocky shore		High	Mod-Low	0.5-4
Tidal flat		High	Low	5.0-10
Subtidal Systems	Fish feeding and nursery ground; sediment containment			
Seagrass		-	High	0.5-50+
Soft bottom		High	Low	10+
Rocky		Moderate	High	2+
Fisheries	Commercial fisheries			
Offshore		Low (except for spawning grounds)	High	-
Nearshore		Mod-High	Low-High	-

- = information unavailable for prediction.
Source: Cairns and Buikema, 1984.

species living contiguously with the sediment are generally considered more sensitive to oil spills than rocky intertidal organisms with the ability to detach from their habitat substrate (Ganning et al., 1984).

The persistence of weathered oil in intertidal sediments has created long-term decreases in abundance and diversity. This persistence creates a chronic release of hydrocarbon constitutents that may retard reproduction and repopulation of the resident community.

A Scenario I spill would have greater tendency to cause stranding of oil on rocky and sandy intertidal areas. A Scenario II spill could occur adjacent to the shallow water habitat and could cause long-term persistence of PHC fractions in the sediments. A Scenario I spill would tend to impact intertidal areas more than subtidal areas. Both scenarios would probably cause long-term impacts on shoreline communities.

Table 4.2.15-4 shows that rocky shore and sandy beach areas suffer high and moderate oil spill damage, respectively. The ecosystem inertia for recovery is moderate to low for rocky shoreline with recovery periods of short term to long term (4 years). Sandy beach has low inertia for recovery with similar recovery time.

6. Fish and Ichthyoplankton. The impacts on fish and ichtyoplankton are the effects of contamination on habitat, food and nutrition physiology, cell and organ function, growth, metabolism, reproduction, behavior, life history, success, or population changes. The dynamic physical and chemical features of a crude oil spill in the harbor (Appendix I.5), coupled with varied biological aspects, have resulted in few, if any, published accounts that clearly correlate oil spills with effects on finfish at the population level (Davis et al., 1984). The concentration and chemical characteristics of the spilled crude and the duration and type of exposure are the most important extrinsic factors in determining effects on fisheries. A direct lethal or sublethal effect on fish may occur.

The life history stage of the species is highly relevant to its susceptibility to adverse effects. In terms of recruitment, the rates of reproduction and larval success and the presence of suitable spawning and nursery areas are critical components for each year-class. Although early life-history stages are typically the most sensitive, only a few reports have documented the effects of spills on finfish recruitment. Some oil contamination events have caused:

(1) Disappearance of the year-class of bottom-dwelling flatfish.

(2) Reduced growth rates for these and other species (Davis et al., 1984).

These observations show both population and physiological stress responses resulting from oil spills. Stress responses among finfish occur frequently and do not necessarily affect species survival or changes in the population structure. These responses do not permit simple correlation of spill events with the full breadth of impacts.

Specific physical impacts on finfish are varied. Mortality may result from direct or prolonged contact with lethal toxicities of PHC. The most toxic fraction for fish appears to be the unsaturated aromatic hydrocarbons, including napthalene. Extensive mortality in a variety of fish has been observed with large spill events although adult fish tend to avoid spills.

Specific physical impacts to fish include:

(1) Clogged gills and damaged gill tissue, causing respiratory stress.

(2) Decreased feeding and loss of weight.

(3) Alteration of cell membrane permeability, especially in the gills, by dissolution of fatty substances with subsequent salt regulation imbalance.

(4) Lethal or sublethal toxicity from exposure or ingestion of PHC constituents.

Species such as the northern anchovy and striped bass (Morone saxatilis) exhibit rapid uptake at sublethal concentrations of benzene [(a low molecular weight (lmw) component PHC]. Localized sites of uptake include gall bladder, mesenteric fat, colon, intestine, liver, brain, gill, heart, stomach, and muscle. Maximum concentrations in the tissues were obtained from 0.25 to 4 days after starting exposure. High uptake in the lipid-rich ovaries was also found, which markedly reduced the viability of the eggs and resultant larvae. For these two fishes, residues were depurated rapidly after cessation of exposure. Another sublethal effect on fish is the interference of nutrition by the blockage of taste receptors and the mimicking of natural chemical messengers that attract predators.

The implication of a spill event in the harbor would be:

(1) Short-term disruption of nursery habitat suitability.

(2) Short-term and possibly long-term decrease in utility of benthic and shoreline feeding habitat.

(3) Possible short- and/or long-term changes in speciation and diversity.

Population decreases of various forms of benthic fauna, including polychaetes and filter feeders, would reduce food supplies for obligate benthic feeders such as flatfish, sargo, and croakers. Oiling of shoreline areas and marine structures would decrease food supplies for many species, including surfperch, rockfish, and gobies (rocky); and barred sand bass, surfperch, California halibut, California corbina, croaker, and sanddab (sandy shoreline).

An extensive impact on phytoplankton and zooplankton would reduce the food supply of the northern anchovy and other pelagic feeders. This could reduce certain year-classes of anchovy or other species with possible long-term population impact. Sublethal short- or long-term accumulation of PHC fractions could occur through the ingestion of contaminated food sources such as zooplankton or filter-feeding invertebrates.

Eggs and larvae are affected by the direct smothering and toxic effects of a spill. Mortality of eggs and larvae could be expected in the harbor in a spill event; the impact would be greatest during spawning periods. Hatching success and rates of normal larval development would decrease in the event of a spill. Most fish eggs and larvae exist in the uppermost surface layers of the water column. Once in the vicinity of oil slicks, those organisms would remain with the slick because movement of both are influenced by currents. Also, larvae do not seem to be able to avoid oil-contaminated water because their chemoreceptors are blocked or destroyed. Larvae and floating eggs might incur abnormal growth and/or mortality. Eggs laid on rocky habitat by midshipman or cabezon could be impacted by the stranding of a spill.

A Scenario I spill could have greater impacts on pelagic species while a Scenario II spill would impact benthic and shoreline community inhabitants. Both scenarios could have long-term impacts on food supply. Short-term impacts on speciation and diversity are more certain to occur than long-term impacts.

Table 4.2.15-4 shows that pelagic fisheries have high ecosystem inertia for recovery with low vulnerability for damage except for spawning grounds. Nearshore fisheries can suffer moderate to high damage with low to high ecosystem inertia for recovery.

7. Avifauna. The effects of oil on the various species is usually related to their behavior patterns. Aerial surveys showed that gulls and terns are unlikely to plunge into oil deliberately, but coastal species, sandpipers, and plovers may paddle over it and squat in it onshore.

Once birds become oiled, the immediate effect is on their plumage; it causes the fine elements of their feathers to adhere together. This breaks down the insulation and water-repellent capacity of the feathers and exposes the bird to the elements. When the plumage becomes oil-soaked and waterlogged, birds lose their buoyancy and ability to fly and dive. With the insulation capacity of their plumage reduced, birds must raise their metabolic rate to maintain their temperature. This is often impossible because of interference with feeding activity.

Experimentally oiled ducks greatly increase their metabolic rates to compensate for heat loss because of a breakdown in the insulating properties of the plumage. Heavily oiled ducks lose twice the heat of normal ducks. Oiled ducks do not or cannot increase their feeding activity to compensate for the increased energy demands. The duck's fat reserves, if any, are quickly depleted, and the birds suffer from accelerated starvation. Accidental starvation during periods of low temperature is usually fatal for most water birds. A patch of oil, 1 in. in diameter on the front side of a murre, was sufficient to destroy the insulating air pocket and cause death from exposure to the chilling effects of the sea.

Birds become sick from the ingestion of oils when attempting to preen themselves. The toxicity level of polluting oil is a definite factor in bird mortality caused by oil pollution. An oiled bird may die from toxic effects, starvation, exposure, or a combination of sublethal impacts. Stress is unlikely to be directly responsible for the death of oiled birds, but it is an important contributing factor (Clark, 1969). Cold, starvation, toxic effects of oil, disturbance, internal injury, and presumably fright combine to cause acute stress. The bird's resistance to secondary infections and the toxic effects of oil is reduced, often beyond the threshold of recovery. Birds under stress are also more vulnerable to predation than healthy birds.

The use of important feeding grounds may decline sharply after pollution by oil, probably because of fouling of the habitat and reduced attractiveness of the area.

Some bird species are more vulnerable to oil than others as indicated by the records of casualties that show a close relationship between the amount of time that a species spends in the water and the frequency of contamination. Migratory birds are affected by deposits of oil that reduce the available food supply of both plant and animal matter in foraging habitats.

In the event of a spill in the harbor, birds could be affected by direct contact with the oil, ingestion of contaminated prey, or loss of foraging or foraging/resting habitat. The impact of a spill could be greatest during the winter-spring abundance maxima of 16,500 individuals (HEP, 1976). A spill that grounds on rocky or shoreline areas or on the shallow water habitat would have a greater potential for lethal or sublethal effects than a spill in the relatively underutilized outer harbor.

The endangered California least tern could be impacted by a spill that contaminates areas used for foraging or decreases food resources of finfish, particularly northern anchovy. A reduction of the food resources could cause a decrease in nesting success and future harbor populations. A Scenario II spill in the area of the shallow water habitat will have greater impact on suitability of foraging habitat. A significant impact on least tern breeding success could occur if an oil spill reaches foraging habitat areas. The occurrence of a spill on heavily used shallow water areas, as determined in a recent report (Massey & Atwood, 1984), could increase the probability of significant impacts on breeding success.

The endangered California brown pelican could be impacted by direct contact with a spill or loss of resting and foraging areas in the outer harbor.

8. Marine Mammals and Sea Turtles. The occurrence of marine mammals and sea turtles in the harbor is extremely sporadic and infrequent. Impacts to marine mammals and sea turtles from the project would be minimal.

No information is available on impacts of oil on sea turtles. Oil can potentially impact marine mammals through contact and ingestion. Effects through contact include direct physical impacts, thermal effects, and extended irritation. Direct ingestion of oil or oiled prey can occur. Studies on seals and cetaceans have not shown that ingested oil will cause stress or death.

G. Impact Summary

Construction activities in POLA would cause several types of impacts to the natural and marine environment. Turbidity generated by dredge and fill activities could cause short-term changes in species diversity and numbers of individual marine animals, including phytoplankton, zooplankton, invertebrates, and fish. A decrease in local availability of northern anchovy for bait and sport fishery could occur. Significant impacts on water quality would alter existing conditions of DO, transparency, and settleable solids.

Species diversity of benthic invertebrates and utility of the benthos as feeding habitat within the proposed 300-acre dredge footprint would decrease during a period of 2 years following dredging. Removal of fine surface

sediments within the dredge footprint could alter the composition of the associated benthic community in the short term.

Fill activities would cause a significant loss of 208 acres of soft bottom habitat; approximately 24 acres of habitat would be gained from new rock dike, benthic side slope, and piling construction.

Dredge and fill activities for the pipeline in the area of the shallow water habitat could significantly decrease the utility of feeding habitat for the endangered California least tern and could cause a significant decrease in breeding success if construction takes place during the April-to-September breeding season. An oil spill reaching the feeding habitat of the least tern could cause similar significant impacts during the breeding season.

Oil spill events in the POLA area would cause significant long-term impacts on the marine environment.

4.2.16 SYSTEM SAFETY AND RELIABILITY

A. Introduction

This analysis describes the risks and consequences of possible upset condition hazards associated with the proposed project, identifies areas that can be improved, and proposes mitigation measures that may be technically and economically feasible. The following topics are considered in the analysis:

(1) Ship traffic hazards

(2) Berthing hazards

(3) Pipeline hazards

(4) Tank farm hazards

(5) Seismic hazards

(6) Facility design

(7) Oil spill contingency and fire protection planning (Appendixes G and H)

The system safety analysis is based on a review of design criteria and project construction and operating procedures. Documents were reviewed for compliance with pertinent regulations and industry standards (i.e., fire hazards, oil spill contingency plans, and available technology). The analysis incorporates information from ongoing meetings between Pactex, POLA, Los Angeles Fire Department (LAFD), USCG, and port pilots to ensure system safety as engineering plans are developed.

The quantification of oil spill risks and impacts is covered in subsection 4.2.17.

The following significance criteria are based on accepted industry practice in the design and operation of hydrocarbon processing and transportation facilities. Any one of the following conditions would result in a significant adverse impact:

(1) Noncompliance with any applicable design code or regulation.

(2) Nonconformance to National Fire Protection Association (NFPA) standards at any location.

(3) Inadequate pressure relief and disposal system design criteria.

(4) Operating policies concerning security, leak detection, spill containment, or fire protection that do not conform to generally accepted industry practices.

The following discussions are by project component, facility, or procedure. Table 4.2.16-1 lists all of the codes and standards applicable to the project.

B. Pipeline and Tank Farm Design with Applicable Codes and Standards

Table 4.2.16-1 provides the principal facilities involved in the proposed pipeline project and the codes and standards to which those facilities would be designed and constructed. Standards and specifications not listed are incorporated in the listed codes by reference. Pactex will follow all applicable codes, standards, and regulations. The following discussions briefly summarize the system design.

1. Seismic Design Criteria. Berthing terminal facility and pipeline loads resulting from seismic activity fall into three categories:

(1) Loads resulting from ground acceleration and consequent response spectra of the pipeline, berthing, and terminal facility.

(2) Differential motion at surface faults.

(3) A combination of the two categories above.

Pactex plans to evaluate active faults to determine the effects of seismic activity on the pipeline system (also, refer to subsection 4.2.4). Specific designs would be developed to accommodate the expected effects of seismic activity. The designs would conform to the applicable stress criteria of ANSI B31.4. Design criteria would include, but would not be limited to, internal design pressure, surge pressure, test pressure, vacuum, fluid inertia loads, temperature, external pressure (including overburden), and differential movement caused by surface fault displacement, local liquefaction, or other loss of support.

A study of a 42-in. crude oil pipeline similar to the Pactex system (Kennedy et al., 1976) contains the following conclusions:

> "Two basic conclusions result from this paper. First, simplified analysis procedures can be used to estimate the behavior of a shallow buried pipeline subjected to large fault movement. Secondly, under conditions of good design and good quality control to assure near uniformity of pipe properties and minimal weld flaws in the fault affected zone, a shallow buried pipe placed in a loose to moderately dense cohesionless soil can withstand large fault movements (as much as 20 feet of movement under nearly ideal conditions."

Table 4.2.16-1 - Applicable Codes and Standards for Berth, Pipeline, and Terminals

Facility	LA MCD 95	CFR 33 154	ANSI B31.4	API 650	API 1104	API 6D	NFPA 30	NEC	Earth-quake Design	49 CFR 195	UBC For Zone	ANSI A58.1	AISC
Berthing	x	x	x		x	-	-	-	x	x	-	-	-
Pipeline valves	-	-	-	-	-	x	-	-	-	-	-	-	-
Pipeline valve locations	-	-	x	-	-	-	-	-	-	x	-	-	-
Hydrostatic testing	-	-	x	-	-	-	-	-	-	x			
Pumps	-	-	-	-	-	-	-	-	-	x	-	-	-
Pump station piping	-	-	x	-	x	-	-	-	-	-	-	-	-
Pump station valves	-	-	-	-	-	x	-	-	-	-	-	-	-
Pump station layout	-	-	x	-	-	-	x	x	-	-	-	-	-
Tank farm piping	x	-	x	-	x	-	-	-	-	-	-	-	-
Tank farm valves	-	-	-	-	-	x	-	-	-	-	-	-	-
Tank farm layout	x	-	x	-	-	-	x	-	-	-	-	-	-
Storage tanks	x	-	x	x	-	-	x	-	x	-	-	-	-
Corrosion	-	-	x	-	-	-	-	-	x	-	-	-	-
Pressure relief	-	-	x	-	-	-	-	-	-	x	-	-	-
Cathodic protection	-	-	x	-	-	-	-	-	-	x	-	-	-
Security	-	-	x	-	-	-	-	-	-	x	-	-	-
Scraper launch and receiving	-	-	x	-	-	-	-	-	-	x	x	-	-
Structures and buildings	x	-	-	-	-	-	-	-	-	x	x	x	x

ANSI B31.4, Liquid Petroleum Transportation Piping System: Prescribes minimum requirements for piping transporting liquid petroleum such as crude oil, condensate, natural gasoline, natural gas liquids, and liquid petroleum projects between producers lease facilities, tank farms, gas processing plants, refineries, stations, terminals and other delivery and receiving points.

American Petroleum Institute (API) 650, Welded Steel Tanks for Oil Storage: Specification covers material, design, fabrication, erection, and testing requirements for vertical cylindrical aboveground, closed and open-top welded steel storage tanks for internal pressures approximating atmospheric. Appendix E of the code provides detailed procedures for designing for earthquake effects.

API 1104, Standard for Welding Pipelines and Related Facilities: Covers welding of piping used in compression, pumping and transmission of crude petroleum, petroleum products and fuel gases, and applicable distribution systems. Also details qualification, testing, and inspection of piping welds, including radiographic procedures.

API 6D, Specification for Pipeline Valves: Specification covers material, design, fabrication, assembly, and testing requirements for valves intended for service in petroleum, petroleum product, and natural gas pipelines.

Los Angeles Municipal Code, Division 95: Sets standards for design and operation of marine oil terminals, tank vessels and barges.

National Fire Protection Association (NFPA) 30, Flammable and Combustible Liquids Code: Prescribes minimum standards of design and operation of equipment and facilities employed in the storage, handling, and processing of flammable and combustible liquids.

Table 4.2.16-1 (Contd)

Title 33, Code of Federal Regulations (33 CFR), Coast Guard: Prescribes equipment requirements for large oil transfer facilities.

Title 49, Code of Federal Regulations (49 CFR), Transportation: The governing Code for the U.S. Department of Transportation, parent organization of the Office of Pipeline Safety. Parts 192 and 195 of the regulation relate to gas and oil piping, respectively, and outlines the minimum requirements for materials, design, fabrication, assembly, construction, operation, inspection, testing and maimtenance of pipelines transporting or storing hazardous gases and/or petroleum and allied products.

Uniform Building Codes (UBC), (Intern'l. Conf. of the Bldg. Offices): Sets forth minimum standards for materials, design, and construction of buildings and appurtenant structures. Has to intrinsic authority but is generally incorporated into local building regulations that do have force of law. Section 73 prescribes procedures for wind and earthquake design.

ANSI A58.1, Minimum Design Loads for Buildings and other Structures: Similar to Section 23 of the Uniform Building Code but provides more detailed procedures for wind and snow load design. Earthquake design procedures are virtually identical to UBC.

American Institute of Steel Construction (AISC): The AISC publishes a number of specifications and recommended practices, the most notable of which are Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings; AISC Code of Standard Practice; and Specification for Structural Points Using ASTM A325 or A490 Bolts. These specifications are updated at regular intervals and are frequently incorporated into law by reference. AISC standards have been accepted as definitive by the steel industry and the engineering profession for many years.

Earthquake Design: This column is intended to show the intent of Pactex to evaluate every active fault crossing. This evaluation would be used in designing for the motions, forces, and resultant stresses generated by predicted fault activity along the pipeline ROW.

Source: ES, 1985.

In spite of the above statement, there is a possibility that during the design and/or construction process the projected seismic activity of a fault would be so large that there is no reasonable design solution. To cope with this event, Pactex has proposed to install control measures such as block and/or check valves to minimize the volume of oil spilled from a failure.

2. Corrosion Design Criteria and Corrosion Control Procedures. Pipeline pitting can occur due to chemical reaction between the soil and the carbon steel pipe. This pitting would reduce the strength of the pipe sufficiently to cause a break and allow an oil leak. Therefore, Pactex intends to coat the pipelines in accordance with applicable regulations. In addition, cathodic protection would be installed as required within 12 months of the pipeline installation depending on soil and chemical conditions. Corrosion control test stations would be installed to test the integrity of the corrosion protection. This is all in accordance with 49 CFR 195.

Because of the low inlet concentrations of H_2S (less than 15 ppm) and water content, internal corrosion is not anticipated to be a problem. During final design, detailed metallurgical studies would be conducted to confirm initial conclusions.

3. Surge and Pressure Relief. Emergency shutdowns, valve closures, and other phenomena can cause the pressure in the pipeline to increase suddenly. Surge studies will be made to ensure that the pipeline will not burst. ANSI B31.4 guides the design of pressure relief systems in terminals and stations where closed systems must be relieved because of thermal expansion of the crude oil. Pactex would incorporate pressure relief provisions into its stations and terminals to sumps.

4. Control Logic and Soundness of Design for Leak Detection System. Pactex has proposed to use a leak detection system using the volume balance method in conjunction with a mathematical pipeline model. This is a widely used and accepted method for leak detection in pipelines. Careful consideration must be given by Pactex to the setting of pipeline conditions, monitoring frequency and the short- and long-term volume balance calculation periods. The short-term period is used to detect large leaks and the long-term period is used to detect small leaks. The response to the leak detection system is addressed in subsection 4.2.17.

The supervisory control systems proposed, of which the leak detection system is a part, would have totally redundant computers and peripheral equipment and would be equipped with uninterruptible power supplies (UPS). All of the remote terminal units would be equipped with standby power. The proposed systems are state of the art for the petroleum industry.

5. Fire Control System. For the pump stations, Pactex has proposed unmanned fire control systems that are consistent with the oil industry for unmanned pump stations (see Appendix H). The systems consist of fire extinguishers and detectors. The fire extinguishers would be available for use if the company staff is at the station during the fire. The detectors would activate the automatic shutdown system for the pump station and alarm

system. After the pump station is shut down, pipeline personnel would be required to travel to the station and investigate the situation before it can be restarted because the design requires that restart from a shut-in condition can only be performed at the station.

The storage facility at POLA and Midland, Texas, would have floating roof oil storage tanks designed, installed, and maintained in conformance with Chapter 2 of NFPA 30, which does not require fire protection. However, Pactex plans a fire protection system including fire mains, hydrants, foam systems, and monitors. It plans to train personnel in the use of these systems. NFPA 30, Flammable and Combustible Liquids Codes, also requires that the distance between the proposed storage tanks and the property line, which is or can be built upon, be at least half the diameter of the adjacent tank as part of the design.

All of the pipeline alignments and pump station locations have been selected to minimize impacts on human receptors. Pump stations to be installed at Wilmington, Rialto, and Blythe, while located near existing oil-related facilities, would be sited to conform with separation requirements of NFPA 30. The ROW is located sufficient distance from sensitive existing facilities, e.g., schools, hospitals, and densely populated areas, to provide no significant impact during construction or operation.

6. Oil Spill Control Systems. Pactex has included a series of block and check valves for control of the loss of oil in the event of a leak or rupture. Block valves are included at each pump station and at the tank farms. Pactex has also proposed block valves upstream (relative to oil side flow) of sensitive stream crossings and a check valve on the downstream side. Current industry technology and standards are proposed by Pactex.

C. Applicable Codes and Standards for Tanker and Berthing Facility

Applicable City of Los Angeles Municipal Codes, including the POLA Master Plan and USCG regulations for the design and operation of the POLA berthing facilities, are listed in Table 4.2.16-1 and in Appendixes G and H. Before operation is commenced, Pactex is required to submit a Terminal Operation Manual to the 11th Coast Guard District for approval. The requirements for the operations manual as specified by 33 CFR 154 are listed in Appendix G.

D. Operating Procedures

1. Security Policies. The following security systems are proposed by Pactex for its pump stations and pipeline block valves:

(1) 6-ft chain link fences topped with anticlimb barbed wire.

(2) Gates would be locked when station is unattended.

(3) A perimeter alarm system would be installed around selected pump stations that would sound a local alarm and an alert to the dispatcher. The dispatcher would then notify local law enforcement officers and company personnel.

(4) If access to the pump station is by private road, the gates at the road entrance would be locked at all times.

(5) The pipeline block valves would be padlocked independent of the fence gate lock.

Security for the pipeline itself would be provided by aerial reconnaissance of the route at intervals not exceeding 2 weeks. This is in accordance with Section 451.5(a) of ANSI B31.4 to which the pipeline is constructed. Ground reconnaissance would be used by Pactex to supplement the aerial reconnaissance only if the aerial reconnaissance indicates a need for it. The proposed security measures are typical for modern pipeline policies proposed for the oil storage facilities at POLA and Midland, Texas, and would be the same as for pump stations.

2. Leak Detection Staff Procedures. Pactex would propose a detailed set of procedures to be followed in the event of a detected leak. These procedures would define exactly who would be contacted and when. Different responses would be designated for different potential events. The procedures would provide clear responsibilities and lines of authority for the leak response team. These procedures would be consistent with those used throughout the oil industry (Appendix G).

3. Fire Protection Staff Training and Procedures. Pactex has proposed fire protection staff training and procedures that are consistent with those typically used throughout the oil industry. Training would consist of classroom training on the extinguishment of fires with emphasis on oil fires. Hands-on training would also be given in the use of extinguishers and firefighting equipment. Management personnel would attend an oil firefighting school at either the Western Oil and Gas Association school in Reno, Nevada, or at the Texas A&M school in College Station (Bryan), Texas. Historically, the training received at oil firefighting schools has been a key element in the operation of a safe petroleum facility. Coordination procedures would also be developed, as per state law, between the local fire departments and the pipeline companies (Appendix H).

4. Committed Operating Procedures. The USCG has already specified and Pactex has agreed to the following operation procedures:

(1) Minimum underkeel clearance would be 10%.

(2) Minimum visibility would be 1 mile.

(3) Minimum of two tugboats would be required per tanker and more would be used when necessary.

(4) Tankers at berth would maintain a minimum of 15% power for emergency exiting.

(5) Trained POLA/POLB pilots would be used.

E. Risk of Fire and Explosion

1. Risk of Tanker Fire and Explosion. Risk forecasts of tanker explosions and fires are based on data for eight U.S. ports and worldwide tanker data, as reported in the draft EIR, Proposed Getty Gaviota Consolidated Coastal Facility (Santa Barbara County et al., 1984, p. 4-89) and are summarized in Table 4.2.16-2. The data does not indicate whether vapor recovery systems were in use or not.

Not all fires and/or explosions are catastrophes. Of all of the tanker fires and explosions, 59% result in damage only to the ship, and 97% (ships in port) cause less than $1,000 damage onshore. Also, the average number of people killed or injured other than those on the vessel is 0.34 per fire and 1.01 per explosion (ships in port). Risk of a "worst possible" accident is much smaller than those shown in Table 4.2.16-2. A catastrophe because of fire/explosion is expected only once every 80 years in the entire United States. A recent example of a catastrophic explosion occurred in Los Angeles on December 17, 1976. The Sansinena, a 70,000-dwt Liberian tanker, exploded while taking on fuel and ballasting. The tanker was 18 years old and had no inert gas system. The principal cause of the explosion was poor design, which allowed venting of the tanks to the main afterdeck, where several sources of ignition were present. In the very light wind conditions, an explosive vapor cloud collected over the afterdeck and ignited. The force of the explosion broke the 810-ft ship in half and propelled the tank deck and midship deckhouses an estimated 750 ft through the air. The tank deck landed on the terminal guardhouse adjacent to the ship. Damage from the explosion resulted in claims totaling $21.6 million. The ship and the terminal adjacent to it were a total loss (Santa Barbara County et al., 1984, p. 4-89).

From a fire and explosion viewpoint, the most dangerous period of time is when a tanker is moored and taking on crude. It is at this time that crude, under high pressure, can accidentally be released and ignited. The POLA facilities are for offloading only. Ships are required to have inert gas systems according to the Pactex tariff.

2. Risk of Fire and Explosion at the Tank Farm. The American Petroleum Institute publishes a report of damage to members' property; between 1972 and 1976, a total of 1,100 tank-farm-years of experience was recorded (for crude

Table 4.2.16-2 - Risk of Tanker Fire and Explosion for the Proposed Project

Accident Type	Location	Per Tanker Call	294 Tanker Calls/Year		
			Chance in Any Year (%)	Frequency (1 incident in no. of years indicated)	Chance Over 30 Years (%)
Fire	Coastal	3.04×10^{-5}	0.5	200	15
Fire	Harbor	1.24×10^{-4}	2.2	45	66
Explosion	Coastal	3.34×10^{-5}	0.6	167	18
Explosion	Harbor	5.16×10^{-5}	0.9	111	27

Source: Santa Barbara County, et al., 1984, p. 4-90.

oil tank farms). Of the fires, 44% caused less than $10,000 damage. Based on these data, the probability of a tank explosion/fire is approximately 0.016 explosion/fire per tank-farm-year, or a 45% chance of a fire causing more than $1,000 damage over the 30-year life of the project. Fire/explosion incidents are usually attributable to one or more of the following reasons (Santa Barbara County et al., 1984, pp. 4-89 to 4-91):

(1) Personnel error such as overfilling tanks or smoking in nondesignated areas.

(2) Equipment failures (roof seal leak, ruptured hoses, etc.).

(3) Natural disasters such as lightning, earthquakes, and floods.

(4) Fires originating outside the facility.

(5) Externally caused fires (airplane crashes, sabotage, etc.).

A marine terminal of this type requires considerable movement of crude oil into and out of the tanks. Human error during tank filling/draining operations may result in overfills, spills, or pressure failures. Many fires have occurred during repair operation when proper precautions have not been taken. The Pactex Emergency Response Plan would address all of the issues that are important to the safe operation of the tank farm, including the following:

(1) Foam/water monitors to cover the exterior surfaces of any of the storage tanks.

(2) Large quantities of water.

(3) Foam/water hydrants (together with the hose) so that all parts of the diked areas are within reach.

(4) Two-stage high liquid level alarms on tanks.

(5) Communications in the field directly with the control center.

(6) Ship-to-terminal direct communication during offloading.

F. Impacts of Fire and Explosion

1. Tanker Fires. Typically, tanker fires occur as a result of crew carelessness while performing repairs and during maintenance operations. These fires usually occur topside or in quarters and are extinguished with only moderate damage. On occasion fires progress sufficiently to cause ship abandonment and are extensive enough to cause total damage to the ship. The POLA Risk Management Plan assesses risks from radiant heat to the surrounding environment (Port of Los Angeles, 1983). The assessment shows that even major fires at the terminal would have little effect on other port facilities unless the tanker broke its mooring and drifted to shore.

2. Tanker Collision. Tanker collisions can occur with other ships or with an offshore platform. In either case, the result is likely to be a large oil spill. If the spill should ignite, a large pool-type fire would result. After the initial flame plume, burning would gradually decrease as the more volatile components of the crude spill are consumed. The fire would be unstable because the ocean would act as a heat sink and cool the unburned crude, and wave action would break up the pool. Eventually, the crude would cool to a temperature below the ignition temperature. If the collision occurred near Pactex's proposed terminal, the fire could seriously expose the underside of the berth to fire and cause serious structural damage; however, there are no flammable materials at the berths near the water level.

3. Tanker Explosions. A tanker explosion can occur only if ignition takes place in the cargo space when that space contains flammable vapors in the flammable range. Vapors in the flammable range typically exist when the cargo space is empty or near empty. These conditions could exist any time an empty tanker attempts mooring at the Pactex terminal with an inoperable or ineffective inert gas system. A tanker explosion at Pactex's proposed terminal would cause considerable damage to pier and wharf facilities and could cause serious injury to personnel in the area. Other POLA facilities would not be affected.

4. Tank Farm Fires. Typically, fires at a tank farm occur as a result of overfilling of tanks, ignition during tank repairs, and failures during tank loading or unloading operations. In almost all cases, the fire is the result of personnel negligence. If the fire reaches major proportions and firefighting efforts are not successful in isolating the fire, it can affect neighboring tanks. Pactex plans to use a spill containment basin design that would allow the crude oil to flow away from the tanks, preventing the fire risk from being spread to other tanks. Most small fires at the proposed Pactex terminal should be quickly brought under control with minimal damage because of the significant capability of Pactex-provided systems and personnel plus the water-based firefighting equipment of the Los Angeles Fire Department (Appendix H). The worst-case situation would be where a tank fire burns for a long period of time and the tank boils over into the diked area of adjacent tanks. Conceivably, several of the tanks in the tank farm could be involved and major damage to the tank farm could result. Personnel near the tank of fire origin may sustain serious injury.

Pactex believes that because of strict limits on water in the crude oil received, a large water layer would not be present in any storage tank. Tank boilovers cannot occur without a large quantity of water since the steam created by the water is the force that causes the boilover.

Placement of the tank farm is in an isolated location and as far as possible from the berthing facility. The siting of the tank farm is consistent with the POLA Risk Management Plan (Port of Los Angeles, 1983). A risk management footprint has been analyzed for the Pactex tank farm.

5. Tank Farm Explosions. Explosions can occur inside storage tanks, usually as a result of tank cleaning operations (without prepurging), welding repairs on the tank shell, or as a result of lightning or static electricity discharge. The result would be serious damage to the tank and serious injury to personnel in the proximity. Most damage from a tank farm explosion would occur from the resultant fire. The potential for major damage at the proposed Pactex terminal would be a result of the fire following the explosion (subsection 4.2.16.G.4). Pactex would provide proper grounding of the tanks, reducing exposure to lightning and/or static electricity discharge. Personnel training and supervision should prevent tank cleaning accidents.

6. Oil Pump Station Fires. Fires that occur around petroleum pump installations are usually the result of piping or fitting failures, pipe flange leaks, or pump gland failure. If the fire is promptly detected, damage should be light to moderate with no personnel injury. However, if the fire is not promptly detected, the pump installation would be severely damaged. The pump station fires at the proposed Pactex project would be controlled with minimal damage. Even under the most adverse conditions, fires should be controllable.

7. Subsea Pipeline Failure. Failure of the subsea pipeline from dredging or from the terminal to shore could occur from dredging or from a large anchor dragging across the pipeline. Rupture could cause a large spill to occur between the terminal and shore. If the pool of crude oil ignited, pier and wharf structures would be exposed and moderately damaged, and boats within the pool would be moderately to severely damaged. There should be no personnel injury to personnel on pier and wharf structures.

Pactex would seek advice from a marine pipeline expert on design and construction features that should minimize this failure possibility. A preliminary assessment is that ship anchors large enough to cause a rupture in a buried concrete coated 42-in. high-strength steel pipeline will be on ships that would run aground before reaching the area where the pipeline would be buried.

G. Seismic Hazards

1. Fault Displacement and Creep. Impacts from fault displacement and creep are expected to be low compared to impacts from ground shaking. The Pactex pipeline would include specific design criteria to mitigate fault displacement and creep across active fault traces. Fault zones in the area crossed by the proposed pipeline that have relatively high probabilities of fault displacement potential in the event of a major earthquake are the San Andreas, San Jacinto, and to a lesser degree, the Whittier-Elsinore fault (Ziony et al., 1974; Hart, 1980). The amount of potential surface displacement during a major earthquake along the San Andreas fault in the area crossed by the pipeline could be a number of feet and thus potentially rupture the pipeline. The greatest recorded slip along the San Andreas was the approximately 21 ft associated with the 1906 San Francisco earthquake (Bonilla, 1970). Fault displacement along the San Jacinto and Whittier-Elsinore faults would also potentially rupture or damage the pipeline.

Creep rates along the San Andreas and San Jacinto faults in the vicinity of the pipeline crossing have not been well documented but are estimated at up to 9 mm/year by Ziony (Personal Communication, 1985). Ziony estimated a creep rate of only about 1 mm/year for the Newport-Inglewood fault and possibly 4 mm to 6 mm/year for the Whittier-Elsinore fault.

Fault zone creep could structurally damage the pipeline within the design life of the project by bending the pipe. The pipe could be bent approximately 9 in. out of alignment in 35 years. Impacts from creep are less potentially damaging than from fault displacement.

2. Seismic Ground Motion. Pactex would design the marine terminal facilities to handle seismically induced stresses. Based on an evaluation by Hart (1980) and Thenhaus (1980) it was concluded that the peak acceleration associated with faults in the POLA area is in the range of 0.4 g to 0.5 g.

Ground shaking at the marine terminal exceeding the design criteria may result in damage to the facilities. Stresses induced by earthquakes at the facilities may be sufficient to damage or rupture the piping at connection points and to buckle tank walls. Welded steel pipelines are inherently ductile and flexible. No buried petroleum pipelines are known to have ruptured from the effects of ground shaking. However, there is a possibility of ruptures at pipeline connections to aboveground tanks, valves, and pumps (Santa Barbara County et al., 1984, p. 4-94).

3. Potential Risk from Aircraft Accidents. The nearest airport to the proposed Pactex facility is located in Long Beach. A negligible risk is anticipated from air traffic accidents because of the distance from the proposed facility to the airport and existing flight approach/takeoff patterns.

H. Supply/Crew Base Operations

Vessel traffic associated with ship supply/crew base operations would average three supply boat trips/day. Tugs and barges bringing materials and supplies to the berthing facilities would average one every 4 days. Berth and terminal (Pactex) personnel boats would average five trips per day.

Operation of a supply/crew base in conjunction with the proposed marine terminal would increase the probability of vessel accidents because of the greater number of intersecting courses between vessels. Marine terminal operations require that a tanker not berth while another tanker is approaching or leaving its berth. However, with the possible three or more supply/crew boat trips per day, movements of these vessels would often occur at the same time as tanker movements.

I. Summary

The system safety and reliability analysis for a project as large and complex as Pactex must balance the risks and consequences associated with construction and operation of the system with the technical and economic feasibility of system design criteria and operations procedures. The Pactex

system will be designed, constructed, and operated in accordance with all applicable codes, standards, and regulations to reduce the possibility and consequences of system failures such as fires, explosions, and product spills.

Design criteria for such site-variable parameters as seismic hazard, stream scour, or corrosion potential will be based on existing information, supplemental studies, as required, and the technical and economic feasibility of specific design criteria. Operating procedures and planned mitigation measures will be in accordance with a variety of regulatory agency requirements such as the POLA Master Plan and associated USCG regulations, as well as good engineering practice. Proper training of operations staff will further ensure system safety by reducing the probability of accidents caused by personnel error.

It should be recognized that all system safety and reliability design criteria, operations procedures, and mitigation measures are intended to reduce the possibility of system failures and/or reduce the adverse impacts associated with such failures. It is rarely even technically possible to design a completely fail-safe system, and even if technically feasible, such a system would almost certainly not be economically viable. Seismically induced system failures, tanker collisions and explosions, and tank farm fires will always be possibilities associated with any system designed to transport crude oil from California to Texas. Professional risk management analysis, environmental assessment and planning, facilities siting and design, and technically and economically reasonable mitigation measures will greatly reduce the probability of catastrophic system failures, as well as reduce the severity of adverse impacts associated with any failure that might occur in the system.

4.2.17 OIL SPILL POTENTIAL

A. Introduction

This subsection discusses the potential frequency and volume of spills for tankers at berth and from the proposed pipeline, as well as an emergency procedures plan to mitigate impacts. The quantification of the risks associated with an oil spill requires:

(1) Estimates of the probability of an accident leading to an oil spill and possible spill magnitude.

(2) A description of the exposure of potentially sensitive target areas to spilled oil.

(3) An assessment of the adequacy of proposed oil spill countermeasures to minimize the likelihood or severity of a spill, and emergency contingency plans to mitigate the impacts of a spill.

The major assumptions that underlie the oil spill risk analysis include:

(1) Past accident frequencies can be used to predict future accident frequencies.

(2) Accidents are statistically independent, random, and sufficiently uncommon (especially major spills) that their probabilities may be described through a statistical relationship called a Poisson distribution. (Oil spills occur randomly and independently of one another and the probability that an oil spill will occur in an interval is proportional to the amount of exposure in that interval.)

(3) Although it is not feasible to assess the risks of all foreseeable types and circumstances of oil spill incidents, the ranges of possible impacts can be estimated from an analysis of selected individual oil spill scenarios.

The proposed Pactex pipeline would cross a variety of ecosystems between the California coast and Texas. Impacts of spills at sensitive areas are addressed in the individual resource subsections in this section (Section 4).

B. Applicable Codes and Standards

Applicable codes and standards for the design of the proposed Pactex project are listed in subsection 4.2.16. In addition to the codes and standards for facility design, the Pactex facilities would require compliance with the following regulations designed to prevent, reduce, contain, and clean up oil spills:

(1) U.S. Environmental Protection Agency

(a) 40 CFR 109, Criteria for State, Local, and Regional Oil-Removal Contingency Plans.

(b) 40 CFR 110, Discharge of Oil.

(c) 40 CFR 112, Oil Pollution Prevention (Spill Prevention Control and Countermeasure Plans).

(2) U.S. Coast Guard

(a) 33 CFR 126, Handling of Explosives or other Dangerous Cargoes Within or Continuous to Waterfront Facilities.

(b) 33 CFR 151, and 158, Reception Facilities; Proposed Rule.

(c) 33 CFR 154, Large Oil-Transfer Facilities (Requirements for Operations Manual; equipment requirements for discharge containment, emergency shutdown, and facility operation; see Appendix G).

(d) 33 CFR 156, Oil Transfer Operations.

(3) U.S. Department of Transportation

49 CFR 195.402, Procedural Manual for Operations, Maintenance, and Emergencies (pipeline systems).

(4) American National Standards Institute/American Society of Mechanical Engineers

ANSI/ASME BB-31.4-1979, Liquid Petroleum Transportation Piping Systems (preparation of emergency plans).

(5) Los Angeles Municipal Code, Division 95

(a) Marine Oil Terminals, Tank Vessels, and Barges.

(b) Port of Los Angeles, Tariff 3, Handling Petroleum Products.

(c) Port of Los Angeles, Port Master Plan.

C. Leak Detection

The system would have the capability to monitor several pipeline parameters that would indicate a leak. This monitoring system would be able to detect a leak and locate its approximate location so that measures could be taken quickly to contain, clean up, and mitigate the effects of the leak.

Three systems would monitor crude oil transport in the pipeline: flow rate metering, volume-balance monitoring, and hydraulic gradient analysis. These systems would be monitored continuously in the operations control center at Pactex headquarters. If a leak were indicated, the pipeline dispatcher would be able to react quickly and initiate the proper operational and oil spill contingency plan actions. Each of the three systems is discussed below, followed by a discussion of their combined use to detect leaks.

(1) Flow Rate Metering. Metering stations would be able to monitor the pipeline continually and detect potential losses with a minimum threshold below 1% of throughput. This would be accomplished by installing a metering system that would constantly monitor the volume of crude and the flow rate passing through the pipeline and then relay the readings to the operations control center. Operations control would transmit readings from each meter station into a master computer that would compare the current flow rates with the previous flow rates and correlate the data with other metering stations. This scan would occur approximately every 30 seconds (Pactex, 1985).

(2) Volume-Balance Monitoring. Meters would be calibrated regularly at POLA and Midland terminals to ensure that the overall line volume was correct. Meters are accurate within 0.1%, and repeatable to 0.05%. This would involve checking the line balance to ensure that the same amount of crude oil entering the pipeline is being received in Midland. This system would be capable of detecting small losses within a few minutes (Pactex, 1985).

(3) Hydraulic Gradient Analysis. This system would incorporate pipeline pressure and temperature monitoring systems that would be combined to analyze the hydraulic gradient along the pipeline route. This system would be able to detect losses exceeding 2%, depending on location (Pactex, 1985).

Although ranges for each of these systems have been presented, it should be noted that detection capability would improve with operating experience, making it possible to identify even smaller losses. These systems would be used together to provide detection of potential leaks. Together, they reduce undetected leaks still further. The amount of oil lost from a pipeline leak would depend on the following factors: throughput rate, detection and verification time, pipeline pressure at the leak point, pipeline shutdown time, hole size, and pipeline drainage.

Operational actions to be initiated by the dispatcher would depend on the size and/or duration of the monitored decrease in throughput. A small decrease (1%) would be monitored for an additional period of time after discovery to see if the system returned to a steady state or if the decrease continued. If the variance were caused by a leak, only a small amount of oil would be lost during this time. Assuming the pipeline was operating at design capacity of 900,000 bpd, approximately 3 barrels of crude oil would be discharged for a 1% decrease in throughput during a 0.5-minute scan period. The additional monitoring period (seeking steady state return) would consume approximately 10 minutes, or a loss of about 62 barrels. The additional time would be required by the pipeline dispatcher so that he could make an accurate assessment of the situation. Thus, a loss of about 65 barrels might occur while the pipeline dispatcher was identifying the leak. If the output from the central computer recorded a decrease less than 1% of throughput, the pipeline dispatcher would attempt to verify the loss before initiating changes in pipeline operations. It should be emphasized that metering systems can indicate variances in the range of 1% and below that are not leaks. These would normally be volume variations caused by temperature or pressure. Both temperature and pressure can normally be predicted and verified by the SCADA

and its associated computer. Such a small variance in throughput might require some time to verify as a leak. In this case, the maintenance base nearest the affected portion of pipeline would be alerted and would immediately initiate an aerial and/or ground reconnaissance of the pipeline to verify the leak. It would be anticipated that any section of the line along the route could be thoroughly patrolled within 2 hours of being directed to do so (Pactex, 1985). Therefore, the volume of oil that could be lost for a leak of 1% of throughput would not exceed 700 barrels before the leak was verified, located, and the pipeline shut down. The total loss would then depend on the additional oil lost by drainage after shutdown. This volume and time required for drainage to occur would depend primarily on the location of mainline valves, pipeline profile, and hole size.

Recorded losses in excess of 1.5% would be treated differently by the pipeline dispatcher. Verification time would be considerably less for large decreases in throughput. Not only would the pump stations record decreases in volume, but drops in pressure would also occur and pumps and pump station valves would automatically shut down. A leak that was discharging more than 1.5% of throughput would be noticeable within minutes of occurrence, and the oil spill contingency plan could be initiated immediately.

The loss rate would vary with hole size and the operating pressure of the pipeline. To illustrate potential losses, Table 4.2.17-1 gives the volume of oil that could be lost per minute for 3 hole sizes at three different operating pressures.

Table 4.2.17-1 - Initial Loss Rates Through Various Openings for Three Different Operating Pressures
(leak rates in barrels per minute)

Hole Diameter (in.)	Internal Pressure (psig)		
	200	400	900
0.5	1.6	2.25	3.36
2	25	36	54
4	103	144	216

The flow rates at the maximum pressure would be impossible to sustain for even a full minute. These flow rates would drop the pressure at the hole toward atmospheric pressure. A 2-in. hole at 900 psig would drop the pressure at that point to 200 psig (or less). A 900-psig pressure leak close to the upstream station would almost instantly increase the flow rate at the station, resulting in a station shutdown because of the low suction pressure caused by the quick increase in flow rate. In relation to this assessment, Table 4.2.17-2 provides a list of spill volumes at sensitive water crossing.

Pipeline drainage could be an important factor in the total volume of a pipeline oil spill. Oil would drain from the pipeline to equalize pressures in the pipeline after shutdown. Drainage would usually be slow for small holes but could occur quickly for the worst-case situation of a major rupture. To minimize pipeline drainage, approximately 71 block valves and check valves would be located along the pipeline route. Valve locations shown on alignment maps in Appendix J include check valves that would be located at major stream crossings and sensitive areas along the proposed route.

Valve closure would be an important factor in limiting the drainage volume of an oil spill. Valve closure would interupt flow along the hydraulic gradient, effectively limiting the amount of oil spilled.

An oil spill would thus be limited to the amounts between valves. Table 4.2.17-2 provides estimates of potential spill volumes at surface water crossings along the pipeline route. These volumes are greater than the estimates or spill size that would occur based on Table 4.2.17-1. Spill volumes in Table 4.2.17-2 would be a worst-case scenario under normal block and check valve operation. If time allowed and if failure could be anticipated, nitrogen could be injected upstream of the block valve, forcing most of the oil out of the crossing in order to limit the oil spill potential still further. In the case of river bank scour, the vibration monitor alert might allow emergency corrective measures to be taken during the flood episode, which could prevent the rupture of the pipeline.

Pipeline failures at rivers are caused by the river's changing course or scouring deeper than the pipeline is installed. In either case, the failure would be preceded by several hours of bottom or bank removal by the river at flood stage.

A scenario used for a pipe failure is when a long section of the pipeline is exposed to the river current. Eddies or vortex shedding set up by the water flow around the pipeline would cause severe vibrations in the pipeline. The exposed pipeline length required for pipe failure would be affected by the velocity of the river flow, pipe size, wall thickness, steel strength, soil strength adjacent to the exposed pipeline, and weight of the pipeline, including concrete coating and crude oil in the pipe. The exposed lengths would likely be in the 100-ft to 300-ft range before failure could result. Movements of the pipe in the highest water velocity area of the exposed pipeline would likely be several inches, several times a minute. This vibration would be significant on both sides of the river, well back from the potential failure point. Pactex would use instrumentation monitors to alert the pipeline dispatchers to an impending failure (Pactex, 1985). This would allow the dispatcher to shut down the pipeline, close the block valve, and send local Pactex personnel to the site equipped with spill containment and cleanup equipment.

Similar vibration monitoring would be used to detect an anchor hooking on the pipe at the POLA harbor pipeline crossing. Marine pipeline experts contend that this is the only likely source of damage to a well-designed and constructed pipeline within the port (Pactex, 1985). A ship with a large enough anchor to damage the pipeline in the harbor would probably run aground before its anchor would hook onto the pipeline.

Table 4.2.17-2 - Estimates of Potential Spill Volumes at Sensitive Water Crossings Along the Pipeline Route

Location of Water Crossing	Distance Between Valves (ft)	Estimated Spill Volume (line rupture) bbl	gal
POLA	4,000	6,591	276,840
Cerritos Channel	1,000	1,648	69,210
Los Angeles River	1,000	1,648	69,210
Santa Ana River (San Timoteo Wash)	300	495	20,763
San Jose Creek	300	495	20,763
Colorado River	1,400	2,307	96,894
Gila River	1,500	2,471	103,815
San Pedro River	1,500	2,471	103,815
Wild Cat Canyon Creek	300	495	20,763
Bass Canyon Creek	300	495	20,763
Rio Grande River	800	1,318	55,368
Pecos River	3,000	4,944	207,630

Source: Pactex, 1985.

If the river exposes the pipeline to its flow, Pactex would be alerted to the situation by the aerial patrol and would take necessary remedial action so that no spill would occur.

Pactex would mitigate the potential oil spills at known active faults by mechanical design, supplemented by the use of seismic instruments transmitting an alarm to the dispatcher so that the pipeline may be shut down until an investigation has been made at the site (Pactex, 1985).

D. Historical Oil Spill Occurrence Rates

An analysis of historical oil spill rates, when applied to the proposed Pactex project and alternatives, helps to identify those components of the project that pose the greatest hazard or risk to the environment. After significant hazards or risks are identified, appropriate mitigating measures can then be developed to reduce potential impacts and improve system safety. The following summary of data on the historical occurrence of oil spills relates to specific facilities common to the proposed Pactex project. This information is offered as a representative indication of potential spill volumes and probabilities of occurrence over the life of the project.

Oil spill occurrence rates and spill size frequency distributions pertaining to tanker spills, submarine pipelines, onshore terminal storage facilities,

and pipelines have been derived from various sources as referenced in the following text.

1. Pipeline Oil Spills. Historical data on pipeline oil spills has been analyzed in terms of both product throughput and miles of pipeline operational per year. For statistical studies on product throughput or volume of oil handled, the possibility of a spill is described in terms of the number of spills per billion barrels transported each year. For statistical studies on the miles of pipeline operational each year, the probability of a pipeline spill is described in terms of the number of spills per mile of pipeline operation each year. In estimating the projected frequency of a spill occurring along the Pactex pipeline system, based on the miles of pipeline operational each year, data was analyzed from the La Sal Pipeline Company EIS, the Northern Tier Pipeline Company EIS, and the U.S. Environmental Protection Agency (1982).

a. Miles of Pipeline Operational Each Year. The projected frequency of spills for the La Sal pipeline EIS was derived from the historical record of 9,000 miles of Exxon's pipeline system to give an estimate of various types of spills as shown in Table 4.2.17-3. The estimate is considered conservatively high because the historical record includes pipelines built under less stringent standards than exist now. Corrosion-caused spills and miscellaneous types of spills account for most of the spills.

Table 4.2.17-3 - Frequency of Occurrence of DOT's Reportable Spills for Four Categories of Causes (9,000 miles of Exxon Pipeline System)

Cause of Outage	Frequency per Mile-Year (1970 to 1980)
Corrosion	0.0005
Structural	0.0001
Outside forces	0.0003
Miscellaneous[a]	0.0006
Total outages	0.0015

[a]Vandalism, weather, equipment failure, etc.
Source: U.S. Department of the Interior, BLM "La Sal Pipeline Company Shale Oil Pipeline Draft Environmental Impact Statement," August 1981.

Table 4.2.17-4 shows the cause of U.S. pipeline accidents over the 5-year period from 1971 to 1975 (EPA, 1982). Pipeline faults, including defective pipe and corrosion, accounted for 56% of the spills and 53% of the volume spilled. Internal corrosion is the largest cause of a spill due to pipeline

Table 4.2.17-4 - Causes of Pipeline Oil Spills
Based on Historical U.S. Statistics

Cause	% of Spills	% of Volume Spilled
Defective Pipe		
Seam failure	12	25
Weld failure	4	6
Other	1	4
Corrosion		
Internal	31	12
External	8	6
Impact Damage		
Equipment impact[a]	31	26
Excavation equipment	3	7
Nonimpact Damage		
Natural causes[b]	4	7
Flow control error	2	3
Other failure	1	3
Other	3	1
Total	100	100

[a]Includes data for all pipelines; equipment impact includes anchor dragging.
[b]"Natural causes" classification would include damage from earthquakes. Only 4% of spills occur from natural causes, which would include landslides, and flood that may have been triggered by an earthquake. Data summaries do not specify earthquake-related spills by a separate category.
Source: EPA, 1982a, Petroleum Leak Detection Study.

fault, although this is more characteristic of older pipelines that were constructed of different materials and did not have the cathodic protection systems proposed by Pactex. However, the spill size associated with corrosion is substantially smaller than a spill resulting from seam failure, the second largest source of pipeline spills. Seam failures are virtually unknown on double-beeveled, submerged, arc-welded pipe as would be used by Pactex. The data in Table 4.2.17-4 includes much lapwelded pipe, which is subject to seam failure. In the category of impact damage, equipment impact accounted for the largest number of spills. The largest volume of oil spilled is also attributed to equipment impacts. The Pactex pipeline route would be marked to DOT standards, and with the use of state-of-the-art leak detection systems and automated block valves, damage from spills should be minimized.

The EPA (1982) report compares mean spill size versus pipe diameter for pipeline accidents reported to the Office of Pipeline Safety (OPS) during the period 1971 to 1975 (Figure 4.2.17-1). Based on this data, the mean spill size for a 42-in.-diameter pipeline would be approximately 8,000 barrels (320,000 gallons).

The Oceanographic Institute of Washington (OIW, 1978) calculated spill rates based on the USCG Pollution Incident Reporting System (USCG PIRS) data for the period 1973-1977. During this period, 1,580 spills >2.4 barrels (100 gallons) in size were recorded for a cumulative total of 728,000 mile-years of pipeline. The inferred rate of spillage is 0.0022 spill >2.4 barrels per pipeline mile-year and 0.0014 spill >10 barrels per pipeline mile-year. The size distribution of oil spills stemming from accidents to onshore pipelines has been evaluated by OIW and is shown in Table 4.2.17-5. It must be noted that these figures are based on a U.S. pipeline nationwide average diameter of 10 in.

Table 4.2.17-5 - Land Pipeline Spill Size Distribution[a]

Spill Magnitude (barrels)	Number	Total Number (%)	Volume (barrels)	Total Volume (%)
2.4-10	582	36.8	3,682	1.0
11-100	754	47.7	30,298	8.2
101-1,000	198	12.5	63,562	17.3
1,001-10,000	41	2.6	147,541	40.1
10,001-100,000	5	0.3	123,091	33.4
Total	1,580	100.0	368,174	100.00

[a]Includes only spills of 2.4 barrels or more between 1973 and 1977.
Source: USCG Pollution Incident Reporting System (OIW, 1978).

When current pipeline design systems and materials that will be used by Pactex are considered, the proposed Pactex pipeline should not experience the corrosion problems that account for 39% of current spills. Also, quality assurance procedures for weld inspection and hydrostatic testing should significantly reduce the defective pipe incidents that account for 17% of current spills. It is anticipated that the spill frequency for a new pipeline would be 0.0003 per mile-year.

Table 4.2.17-6 summarizes the expected incidence of spills exceeding 9.5 and 50 barrels for the proposed Pactex pipeline.

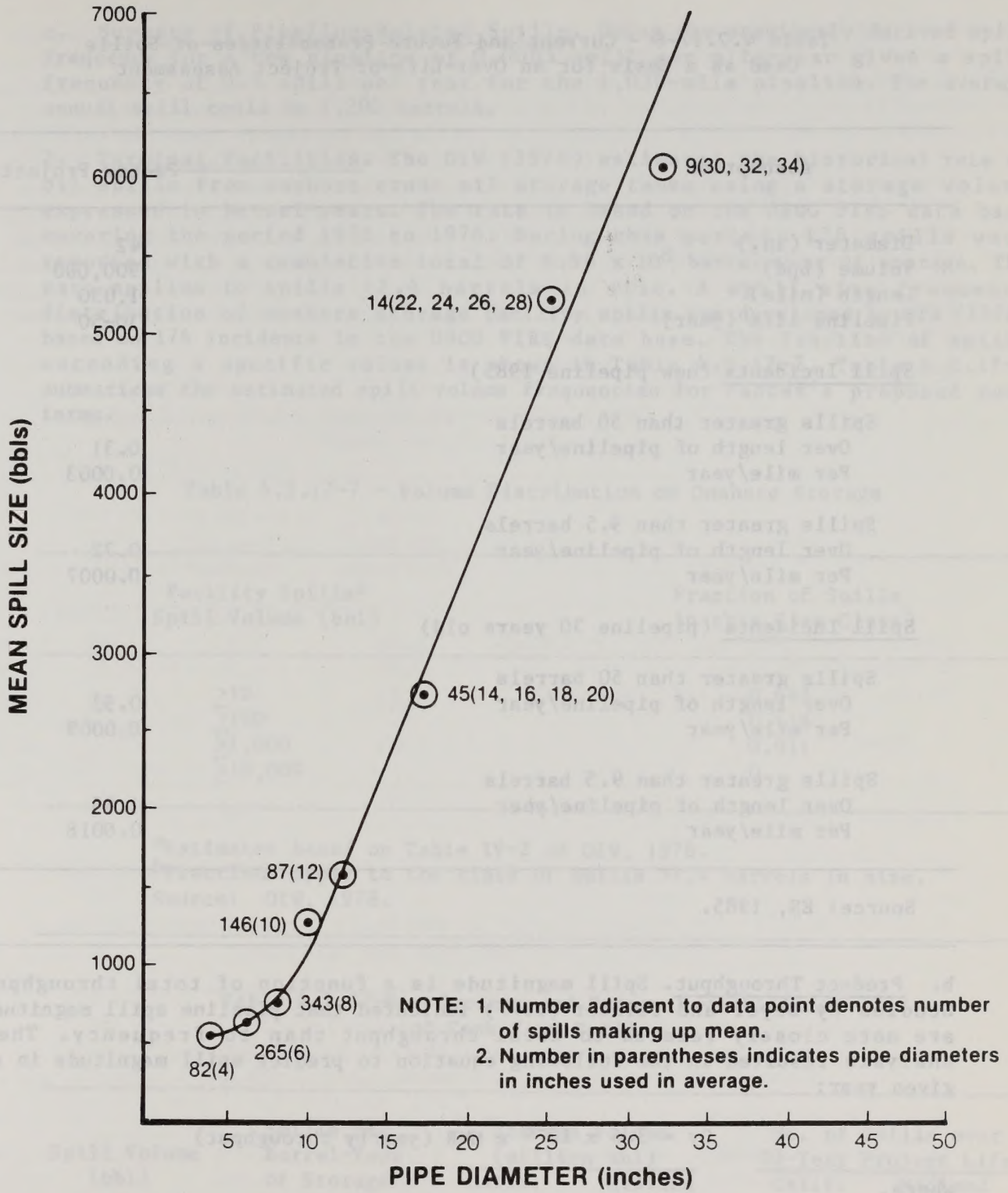


Figure 4.2.17-1 - Mean Spill Size and Line Pipe Diameter for Line Pipe Accidents Reported to OPSO (1971-1975) (EPA, 1982)

Table 4.2.17-6 - Current and Future Probabilities of Spills Used as a Basis for an Over-Life-of-Project Assessment

Assumption	Pactex Project
Diameter (in.)	42
Volume (bpd)	900,000
Length (mile)	1,030
Pipeline life (year)	30-50
Spill Incidents (new pipeline 1985)	
Spills greater than 50 barrels	
Over length of pipeline/year	0.31
Per mile/year	0.0003
Spills greater than 9.5 barrels	
Over length of pipeline/year	0.72
Per mile/year	0.0007
Spill Incidents (pipeline 30 years old)	
Spills greater than 50 barrels	
Over length of pipeline/year	0.93
Per mile/year	0.0009
Spills greater than 9.5 barrels	
Over length of pipeline/year	1.85
Per mile/year	0.0018

Source: ES, 1985.

b. Product Throughput. Spill magnitude is a function of total throughput. Studies by Beyer and Painter (1977) indicated that pipeline spill magnitudes are more closely related to total throughput than to frequency. Their analysis resulted in the following equation to predict spill magnitude in any given year:

$$Qy = 3.6 \times 10^{-6} \times MMB \text{ (yearly throughput)}$$

where,

Qy = barrels spilled
MMB = volume in million barrels

Using the projected annual throughput for the Pactex pipeline of 328.5 million barrels (328.5 million bpy), the predicted total magnitude of all types of spills in a given year would be about 1,200 barrels.

c. Summary of Pipeline-Related Spills. Using the previously derived spill frequency for a new pipeline of 0.0003 spill per mile-year gives a spill frequency of 0.3 spill per year for the 1,030-mile pipeline. The average annual spill could be 1,200 barrels.

2. Terminal Facilities. The OIW (1978) estimated the historical rate of oil spills from onshore crude oil storage tanks using a storage volume expressed in barrel-years. The rate is based on the USCG PIRS data base covering the period 1973 to 1976. During this period, 176 spills were reported with a cumulative total of 6.98×10^8 barrel-year of storage. The rate applies to spills $\geq$2.4 barrels in size. A spill size frequency distribution of onshore storage facility spills was developed by OIW (1978) based on 176 incidents in the USCG PIRS data base. The fraction of spills exceeding a specific volume is shown in Table 4.2.17-7. Table 4.2.17-8 summarizes the estimated spill volume frequencies for Pactex's proposed tank farms.

Table 4.2.17-7 - Volume Distribution on Onshore Storage

Facility Spills[a] Spill Volume (bbl)	Fraction of Spills in this Size Class[b]
$\geq$10	0.642
$\geq$100	0.148
$\geq$1,000	0.011
$\geq$10,000	0

[a]Estimates based on Table IV-2 of OIW, 1978.
[b]Fractions apply to the class of spills >2.4 barrels in size.
Source: OIW, 1978.

Table 4.2.17-8 - Current and Future Probabilities of Tank Farm Spills

Spill Volume (bbl)	Spills per Barrel-Year of Storage	Storage Volume (million bbl)		No. of Spills over 30-Year Project Life	
		Calif.	Midland	Calif.	Midland
10	2.52×10^{-7}	4	6	30	45
100	5.7×10^{-8}	4	6	7	11
1,000	4.9×10^{-9}	4	6	0.6	1
10,000	0	4	6	0	0

3. Tanker Oil Spills. Oil spill risks associated with oil transport by tanker are related to factors such as environmental and geographical aspects of the area of interest, properties of this tanker route (ship traffic), traffic control schemes, and the magnitude of operations, including the number of port calls necessary to handle the estimated pipeline throughput. Data presented for west coast tanker oil spills at the American Petroleum Institute's 1977 and 1979 Oil Spill Conference was extracted to analyze the risk of oil spills in POLA. Bright (1979) estimated the expectancy of tanker accidents based on a 1980 mix of tankers ranging in size from 16,700 dwt to 120,000 dwt (Table 4.2.17-9). However, vessel accidents do not necessarily result in oil spills. The probability that a given type of tanker accident would result in an oil spill (but not the amount spilled) was estimated by Bright (1979) (Table 4.2.17-10).

Table 4.2.17-9 - Tanker Accident Expectancy per Thousand Voyages (by location and cause)

Accident	Piers, Harbors, Entrances	In Coastal Waters	At Sea	All
Collisions, rammings, and groundings	2.34	0.47	0.05	2.86
Structural failures	0.03	0.01	0.61	0.66
Fires, explosions, and breakdowns	0.28	0.11	0.45	0.83
Total	2.65	0.59	1.12	4.36

Source: Bright, 1979.

Table 4.2.17-10 - Probability of an Oil Spill after a Tanker Accident (specific accident type and location)

Accident	Piers, Harbors, Entrances	In Coastal Waters	Open Sea	All
Collisions, rammings, and groundings	0.138	0.379	0.133	0.194
Structural failures	0.900	0.250	0.201	0.236
Fires, explosions, and breakdowns	0.247	0.182	0.078	0.147
Total (average)	0.178	0.341	0.148	0.192

Source: Bright, 1979.

Beyer and Painter (1977) developed a statistical analysis for predicting tanker spill volumes based on the number of vessel port-calls, volume of cargo transported, and number of vessel-years of operation. Bright (1979) used this analysis method to predict spill recurrences at California's port/terminal areas. This data is shown in Table 4.2.17-11 and is representative of tanker traffic in San Pedro Bay.

Table 4.2.17-11 - Spill Recurrence Intervals and Probabilities for Selected California Locations[a]

Location	Spill Size (gallons) 50	100	1,000	10,000	50,000
Port/Terminal Area					
Port of Long Beach					
RS[a]	0.13	0.17	0.85	2.43	5.66
PS 20 years[b]	1.0	1.0	1.0	1.0	0.97
Port of Los Angeles					
RS[a]	0.22	0.28	1.39	3.97	9.26
PS 20 years[b]	1.0	1.0	1.0	0.99	0.88
Geographical Area					
San Pedro Bay					
RS[a]	0.14	0.17	0.86	2.46	5.75
PS 20 years[b]	1.0	1.0	1.0	1.0	0.97
Southern California					
RS[a]	0.05	0.06	0.29	0.84	1.96
PS 20 years[b]	1.0	1.0	1.0	1.0	1.0

[a]Recurrence interval (years) for spills of size $\geq$S (i.e., the average time interval between spills of size greater than or equal to S).
[b]Fractional probability of having at least one spill of size $\geq$S over 20 years (assumes Poisson distribution for spill frequency).
Source: Beyer and Painter, 1977.

The Getty Gaviota EIS (Getty, 1983) stated that approximately 114,000 ship transits of the Santa Barbara Channel occurred since the establishment of the vessel traffic separation scheme (VTSS) in 1969 with no collisions between ships moving through the channel. Based on a Poisson binomial distribution, a 95% confidence upper-bound on the rate of collision per transit was calculated to be 2.6×10^{-5} (Getty, 1983). The worldwide collision port

average was estimated to be 1×10^{-3} per port call (Watson et al., 1979). For tankers calling at the Pactex terminal, a conservative estimate of collisions, assuming a tanker is empty 50% of the time, would be:

$$0.5 \times 2.6 \times 10^{-5} = 1.3 \times 10^{-5}$$

4. Submarine Pipeline. The submarine pipeline connecting the POLA terminal to shore does not contribute significantly to the oil spill risk vis-a-vis the contributions from POLA operations or tanker casualty spills. An assessment done by NDE (1983) estimated the frequency of submarine pipeline rupture to be about 1×10^{-3} per year. The Futures Group (Futures, 1982) also analyzed data for submarine oil pipelines although not of the pipeline diameter assumed for this project. Their accident rate was 5.2 spills/600-mile-length pipeline per year or 0.017 spill for a 2-mile-long pipeline. Of the spills analyzed, however, only 20% were more than 10 barrels in size and less than 7% were more than 100 barrels. Thus, a nonnegligible spill rate of perhaps only 3×10^{-3} per year is indicated by the Futures Group. If a spill from submarine pipeline is considered comparable in impact to a nonnegligible operational spill, the rate of the latter is 0.013 spill per port call, implying an expectation of at least a few spills per year versus a one-thousandth submarine pipeline spill per year. Thus, the submarine pipeline impact appears negligible compared to the operational spill impact. Oil containment equipment provided by Pactex and others in the harbor would significantly decrease the spread of a spill.

E. Pipeline Spill Prevention

Pipeline safety measures proposed by Pactex would include both leak-avoidance and leak-detection measures. Leak-avoidance measures include careful material and system design, adequate depth of burial, hydrostatic pressure testing, corrosion prevention and inspection, and block valve systems. Descriptions of proposed spill prevention measures and maintenance procedures are presented in subsections 2.2 and 4.7.17.

F. Oil Spill Contingency Plan

During final design of the product pipeline, an oil spill contingency plan would be developed, reviewed, and approved by the USCG and the EPA. Operations headquarters at POLA would contain a control center attended 24 hours a day, 7 days a week. Electronic instrumentation would continuously monitor pipeline pressure and flow conditions at key points and would sound an alarm any time a deviation in pressure or flow indicates an unusual condition in the pipeline system. The Oil Spill Contingency Plan would be divided into three sections:

(1) Port and Terminal Facility
(2) Pipeline System
(3) Midland Terminal

An outline and required information for the OSCP is given in Appendix G.

G. Summary

For any petroleum product transportation system such as Pactex, it is possible to estimate the probability of accidents that might cause oil spills. Spill prediction is based on historical information regarding operation of existing pipelines, tank farms, and tanker terminals. This information is compiled by such organizations as the Oceanographic Institute of Washington and the American Petroleum Institute. The spill prediction probabilities for Pactex are based on such information and are considered to be conservatively high estimates because many of the pipelines, tank farms, and terminals from which this data has been collected were designed to less stringent criteria in an era of less environmental awareness and regulatory requirements than exists today.

The Pactex project will be designed, constructed, and operated in accordance with all current codes, standards, and regulatory requirements. Some of the major design features that will reduce the probability of spills are the planned use of double-beveled, submerged, arc-welded pipe, block and check valves at major stream crossings, vibration monitors to detect seismically induced stresses or stream scour problems, and a sophisticated leak-detection system. In addition, operational measures including booms around berthed tankers, oil spill cleanup equipment, and staff training and weekly aerial reconnaissance of the pipeline route will further reduce both the probability of spill occurrences and the severity of any adverse impact associated with any spill that might occur in spite of preventive design and operational features.

4.3 COACHELLA VALLEY ALTERNATIVE

This subsection, as a comparative analysis to the Pactex proposal, presents a discussion of environmental consequences that would result from selection of the Coachella Valley Alternative.

4.3.1 AIR QUALITY

Construction of the pipeline via the Coachella Valley Alternative would result in nearly identical amounts of air pollutants being released during construction. Operational emissions would be identical.

4.3.2 GEOLOGIC AND SEISMIC SETTING

At its widest point, the Coachella Valley Alternative would be located several miles farther south from the San Andreas Fault than the proposed route. Consequently, this alternative would experience slightly reduced ground accelerations in the event of an earthquake, thus reducing the potential for earthquake-induced damage to the pipeline. However, the distance would not be so great as to prevent serious damage in the event of a strong earthquake. Secondary effects such as liquefaction could still occur, particularly in the pipeline segments across the Whitewater River. No other substantive differences were found from those of the proposed route.

4.3.3 SOILS

No substantial difference in the environmental consequences of this alternative was found from those of the proposed pipeline route. The minor differences in the soils associations described in subsection 3.3.3 would not be expected to result in any additional or reduced impacts during construction or operation of the pipeline.

4.3.4 SURFACE WATER

The only difference from the proposed route is that two crossings of the Coachella Canal would occur in the vicinity of Indio. No impacts would be expected to occur to this concrete channel; the design would bore underneath the channel, thereby avoiding any degradation of water quality resulting from construction or oil spills during operation.

4.3.5 GROUNDWATER

As described in subsection 4.2.5, any impacts to the groundwater aquifers in the Coachella Valley would be significant. Because of the extensive use of water for irrigation and municipal supplies and because of the very low natural recharge rates, any contamination of the groundwater would be significant. However, this alternative would be expected to present about the same likelihood of contamination from oil spills as that of the proposed route.

4.3.6 FRESHWATER BIOLOGY

Few aquatic resources would be impacted by the Coachella Valley Alternative. No important fish species occur in the intermittent streams that would be encountered.

4.3.7 TERRESTRIAL BIOLOGY

No substantive difference was identified between impacts to vegetation and wildlife along the Coachella Valley Alternative and those described for the proposed route through the Coachella Valley. Field assessment of the alternative route indicates that approximately 0.6 mile (8 acres) of actual occupiable CVFTL habitat would be disturbed (see Figure 3.2.7-3). Other potentially occupiable habitat exists along this alternative route but presently lacks all of the characteristics necessary for occupation by CVFTL. Federally designated CVFTL critical habitat would not be affected by this alternative. Loss of individual CVFTL would be a significant impact. However, proper positioning of the pipeline ROW may actually serve to perpetuate CVFTL habitat (see subsection 4.2.7.G).

Two rare plant species, Coachella Valley milkvetch and flat-seeded spurge, occur along the alternative route (Knehr, 1985, personal communication).

4.3.8 SOCIOECONOMICS

The impact resulting from the Coachella Valley Alternative would be little, if any. Some slight increase in the tax base of Riverside County could occur. Housing, population, and employment effects would be the same as discussed in subsection 4.2.8.

4.3.9 LAND USE AND RECREATION

The route proposed for the Coachella Valley Alternative would traverse predominantly open space/desert lands along existing utility corridors. Construction through this area would not be expected to cause major impacts because both existing vegetation and rural development are sparse. Impacts would be minor inconveniences and would last only for the duration of the construction activities. No impact to the special-use areas identified in subsection 3.3.9 would be anticipated. No major impingement to recreational resources would occur.

4.3.10 TRANSPORTATION, ENERGY, UTILITIES, AND PUBLIC SERVICES

The Coachella Valley Alternative would parallel the south side of I-10 from the Palm Springs area to Myoma. I-10 would be crossed the same number of times as in the Pactex proposal, but at different points. All other impacts to transportation, energy, utilities, and public services would be the same as described in subsection 4.2.10.

4.3.11 CULTURAL RESOURCES

There are no known sites in this segment; however, it has not been surveyed for cultural resources. There is a potential for damage or loss of unknown sites. The absence of known sites, the general environmental setting, and previous disturbance suggest that few cultural resources would be found along the alternative route.

4.3.12 PALEONTOLOGY

The Coachella Valley Alternative would impact moderately important Quaternary continental sediments that have a potential for producing late Pleistocene vertebrate remains. Unlike the proposed route, no known fossil locality and no highly important area would be crossed.

4.3.13 VISUAL RESOURCES

There would be no major river crossing or aboveground facility along the Coachella Valley Alternative. The pipeline would parallel the Santa Fe Railroad alongside Highway 10 through an area not classified as highly scenic. It is not anticipated that the pipeline would appreciably alter the visual resources along this alternative route.

4.3.14 NOISE

Noise impacts would be similar to those discussed for the Pactex proposal, except that residents of Myoma would be subjected to elevated noise levels during construction. This would be a short-term significant impact.

4.3.15 OCEANOGRAPHY AND MARINE BIOLOGY

(not applicable)

4.3.16 SYSTEM SAFETY AND RELIABILITY

Impacts to system safety would be the same as those described for the Pactex proposal.

4.3.17 OIL SPILL POTENTIAL

The probability of a spill with the Coachella Valley Alternative would be the same as that for the Pactex proposal.

4.4 POLA LANDFILL ISLAND ALTERNATIVE 1

4.4.1 AIR QUALITY

Construction under this alternative would require the same amount of construction equipment as presented in the Pactex proposal. Because this alternative involves construction on a slightly smaller land parcel, fugitive dust emissions would be slightly smaller. Operational emissions would be identical to those in the Pactex proposal (subsection 4.2.1).

4.4.2 GEOLOGIC AND SEISMIC SETTING

No substantive difference in environmental consequences would result from this alternative. The island configuration is essentially the same as the proposed design. Although it is somewhat smaller (96 acres versus 115 acres), the landfill island would be subject to the same fault rupture and seismic effects. The potential for earthquake-induced liquefaction and landslides would still be present with this configuration.

4.4.3 SOILS

No substantive difference in environmental consequences to soils is associated with this project.

4.4.4 SURFACE WATER

No impact to surface water (i.e., freshwater) is associated with this alternative.

4.4.5 GROUNDWATER

No impact to groundwater is associated with this alternative.

4.4.6 FRESHWATER BIOLOGY

No impact to freshwater biology is associated with this alternative.

4.4.7 TERRESTRIAL BIOLOGY

No impact to terrestrial biology is associated with this alternative.

4.4.8 SOCIOECONOMICS

The impact resulting from Alternative 1 would be the same as that in the Pactex proposal. Housing and labor are ample in the POLA area.

4.4.9 LAND USE AND RECREATION

Construction of the 96-acre alternative landfill island would result in a loss of harbor surface area for port traffic. The impact to outer harbor anchorages would be consistent with that associated with the proposed project, i.e., an anticipated loss of 4 to 6 anchorage sites would occur.

The impact to recreation in POLA would be the same as described in subsection 4.2.9 and would include loss of surface acreage available for recreational boating and a potential reduction of recreational fishing during construction.

4.4.10 TRANSPORTATION, ENERGY, UTILITIES, AND PUBLIC SERVICES

Because the landfill area would be reduced, the duration and perhaps the level of construction activity at POLA would be reduced. This would lower the amount of barge and dredge activity during construction below that anticipated for the Pactex proposal. Reduction of the channel depth to 70 ft. would affect access of the larger tankers at times other than at high tide.

4.4.11 CULTURAL RESOURCES

There will be no substantive change from the proposed Pactex Project.

4.4.12 PALEONTOLOGY

Reduction of the area to be filled by 25 acres and the dredging depth by 5 ft would reduce the amount of moderately important, potentially fossiliferous Quaternary sediments that would be disturbed by dredging and covered by filling compared to the proposed project.

4.4.13 VISUAL RESOURCES

No substantive difference in impacts from the proposed project is expected. Construction of the 96-acre landfill island would reduce the open water view of the port, diminishing the existing high usual quality of the outer harbor. Because of the proposed placement of the landfill terminal, the visual impacts to harbor traffic, including recreational boaters, would be greater than for land viewers.

4.4.14 NOISE

A smaller berthing facility of 95 acres (17% smaller than the preferred alternative) would require a slightly shorter construction period. This shorter period would slightly reduce noise generated by the project, but the difference would not result in major changes in the expected noise impact.

4.4.15 OCEANOGRAPHY AND MARINE BIOLOGY

(1) Dredge and Fill Components

(a) Tidal Velocity, Discharge, Flow Volume, and Circulation. There would be no significant impact on existing conditions of tidal elevation, amplitude, and phase caused by the Alternative 1 configuration. There would be a tidal prism reduction of approximately 30.7 million ft^3 for a 7-ft spring tide range (extrapolated from Seabergh, 1985). The Alternative 1 would not affect outer harbor circulation, except for an

approximately 3% decrease in flow volume through Angel's Gate (Seabergh, 1985).

(b) Harbor Resonance. Changes in harbor oscillations from existing conditions in the harbor should be minimal with Alternative 1 because of its small size (Seabergh, 1985). The potential impacts could be similar to those discussed in subsection 4.2.15.A.2.

(c) Water Quality. The potential impact on water quality with Alternative 1 would be similar to, but of slightly less magnitude than, the proposed landfill discussed in subsection 4.2.15.A.3. Alternative 1 would use 11 million yards of dredged spoil. This would represent approximately 27% less dredging than the proposed landfill island. The construction schedule and, therefore, temporal breadth of impacts should be identical for the proposed landfill island and Alternative 1.

(d) Sediment Regime. The sediment regime under the 96-acre landfill would be altered completely by the deposition of 11 million yards of dredged material. A total island footprint of 183 acres would be affected (Appendix I, Table I.4-1). The south and east perimeters, an area of 24 acres, would have the existing sediment covered by the rock dike.

(e) Habitat. The impact on marine life and harbor habitats would be similar to that discussed for the proposed landfill in subsection 4.2.15.A.5. The impact relating to dredge and fill activities could be slightly reduced because of the smaller island size and dredge volume of Alternative 1. The primary dike and fill impact would be the loss of deep soft bottom benthic habitat under the 183-acre footprint of the island, beach, and dike (Table I-8). The dike would provide 18 acres of new rocky habitat.

(2) Structural Island Components

The impacts caused by the structural island components are identical to those discussed for the proposed project in subsection 4.2.15.B.

(3) Liquid Effluent and Scrubber Intake-Outfall

The impacts caused by the liquid effluent and scrubber intake-outfall are identical to those discussed for the proposed project in subsection 4.2.15.C.

(4) Staging Area

The impacts caused by the staging area are identical to those discussed for the proposed project in subsection 4.2.15.D.

(5) Vessel Traffic

The impacts caused by vessel traffic are identical to those discussed for the proposed project in subsection 4.2.15.E.

(6) Oil Spills

The impacts caused by oil spills are identical to those discussed for the proposed project in subsection 4.2.15.F.

4.4.16 SYSTEM SAFETY AND RELIABILITY

The lesser setback distance between the berths and the tank farm would decrease the margin of safety.

4.4.17 OIL SPILL POTENTIAL

No substantial difference from the proposed project was found for oil spill potential.

4.5 POLA LANDFILL ISLAND ALTERNATIVE 2

4.5.1 AIR QUALITY

Construction under this alternative would require the same amount of construction equipment as presented in the Pactex proposal although construction will occur over an additional 12- to 14- month period. Because this alternative involves construction on a larger land parcel, fugitive dust emissions would be higher. Detailed construction requirements for this alternative have not been developed; therefore, detailed emission comparisons cannot be made. Operational emissions would be identical to those in the Pactex proposal (subsection 4.2.1).

4.5.2 GEOLOGIC AND SEISMIC SETTING

This landfill island configuration would be exposed to the same geologic and seismic environment as the proposed project; however, the design of this alternative would result in an island with reduced potential for earthquake-induced ground failure. The nature of the fill material would be essentially the same, presenting some potential for liquefaction-induced failure of facilities such as the tank farm, depending on the final geotechnical evaluations and design. However, the rock dikes surrounding the island would result in much lower potential for earthquake-induced liquefaction and landslides leading to lateral spreading of the fill material. The actual potential for ground failure cannot be determined at this time because the final design of the revetment system is not available.

4.5.3 SOILS

No substantive difference in environmental consequences to soils is associated with this project.

4.5.4 SURFACE WATER

No impact to surface water (i.e., freshwater) is associated with this alternative.

4.5.5 GROUNDWATER

No impact to groundwater is associated with this alternative.

4.5.6 FRESHWATER BIOLOGY

No impact to freshwater biology is associated with this alternative.

4.5.7 TERRESTRIAL BIOLOGY

No impact to terrestrial biology is associated with this alternative.

4.5.8 SOCIOECONOMICS

The impact resulting from Alternative 2 would be the same as that in the Pactex proposal. There would be an increase in labor requirements at POLA, labor and housing are plentiful in the POLA area.

4.5.9 LAND USE AND RECREATION

Construction of the 170-acre landfill island would result in a loss of surface area for harbor traffic. The impact to outer harbor anchorages would be consistent with that associated with the proposed project, i.e., an anticipated loss of four to six anchorage sites would occur. The impact to recreation in POLA would be the same as described in subsection 4.2.9 and would include loss of surface acreage available for recreational boating and a potential reduction of recreational fishing during construction.

4.5.10 TRANSPORTATION, ENERGY, UTILITIES, AND PUBLIC SERVICES

Because the landfill area would be expanded, the duration and level of construction activity at POLA would be increased. This would increase the amount of barge and dredge activity during construction above that anticipated for the Pactex proposal. The increase in dredging activity would have little, if any, impact on commercial shipping activity because the dredges operate outside the shipping lanes. The increased level of barge traffic, perhaps 30% to 40% above that estimated for the Pactex proposal, still represents a small number of daily operations at POLA compared to harbor activity generated by commercial, pleasure, and fishing vessel movements.

4.5.11 CULTURAL RESOURCES

Although the area (508 acres) is the same as the proposed Pactex project, the landfill configuration is different on the west side. This will affect an additional site, making a total of four sites that may be impacted.

4.5.12 PALEONTOLOGY

No substantive difference from the proposed project was found with respect to the amount of potentially moderately important Quaternary sediments that would be impacted.

4.5.13 VISUAL RESOURCES

No substantive difference from the proposed project was found. Construction of the 170-acre landfill island would reduce the open water view of POLA, diminishing the existing high visual quality of the outer harbor. Because of the proposed placement of the landfill terminal, the visual impacts to harbor traffic, including recreational boaters, would be greater than for land viewers.

4.5.14 NOISE

The increased landfill acreage (48% greater than the proposed preferred alternative) would require a longer period of construction activity, which would result in noise being generated over a longer period of time. Because project construction noise in the harbor area is not expected to be disturbing, the larger island alternative would not change the noise impact expected for the Pactex proposal.

4.5.15 OCEANOGRAPHY AND MARINE BIOLOGY

(1) Dredge and Fill Components

(a) Total Velocity, Discharge, Flow Volume, and Circulation. There would be no significant impact on existing conditions of tidal elevation, amplitude, and phase caused by the Alternative 2 configuration. There would be a tidal prism reduction of approximately 40.6 ft^3 for a 7-ft spring tide range (extrapolated from Seabergh, 1985). Alternative 2 would not affect outer harbor circulation, except for an approximately 3% decrease in flow volume through Angel's Gate (Seabergh, 1985).

(b) Harbor Resonance. Changes in harbor oscillation and wave amplification from existing conditions should be minimal with Alternative 2 (Seabergh, 1985). The potential impact could be similar to that discussed for the proposed landfill island in subsection 4.2.15.A.2. There could be less reflection of short period waves (i.e., less than a 30-second period) because of the diking on the north and west sides.

(c) Water Quality. The dredging-related water quality impact with Alternative 2 would be similar to that discussed for the proposed landfill in subsection 4.2.15.A. Fill-related water quality impact would be similar but possibly of a different magnitude than that discussed in subsection 4.2.15.B. There would be potential for a longer duration of turbidity generation because of the additional 12-month period required for construction of the north and west side dikes.

There could be a shorter dewatering period with the diked construction. This could reduce the spatial and temporal generation of turbidity and reduce the elutriate levels of any contaminant associated with the fill.

(d) Sediment Regime. The sediment regime under the 170-acre landfill would be altered completely by the deposition of 15 million yards of dredged material and placement of the rock dike. A total island footprint of 208 acres would be affected (Appendix I, Table I.4-1). An area of 38 acres would have the existing sediment covered by the rock dike.

(e) Habitat. The impact on all trophic levels and harbor habitats would be similar to that discussed in subsection 4.2.15.A.5. The primary dike-and-fill impact would be the loss of deep soft benthic habitat under the 208-acre footprint of the island and dike (Table I-8). The dike would provide 31 acres of new rocky habitat.

(2) Structural Island Components

The impacts caused by the structural island components are identical to those discussed for the proposed project in subsection 4.2.15.B.

(3) Liquid Effluent and Scrubber Intake-Outfall

The impacts caused by the liquid effluent and scrubber intake-outfall are identical to those discussed for the proposed project in subsection 4.2.15.C.

(4) Staging Area

The impacts caused by the staging area are identical to those discussed for the proposed project in subsection 4.2.15.D.

(5) Vessel Traffic

The impacts caused by vessel traffic are identical to those discussed for the proposed project in subsection 4.2.15.E.

(6) Oil Spills

The impacts caused by oil spills are identical to those discussed for the proposed project in subsection 4.2.15.F.

4.5.16 SYSTEM SAFETY AND RELIABILITY

No substantive difference in environmental consequences to system safety and reliability from the proposed project was found.

4.5.17 OIL SPILL POTENTIAL

No substantive difference from the proposed project was found for oil spill potential and effects.

4.6 CUMULATIVE IMPACTS

Three projects, the Palo Verde-Devers transmission line, the Celeron/All-American pipeline, and the future planned San Pedro Bay outer harbor developments (all presented in Section 2), as well as the proposed Pactex project, are analyzed for cumulative impacts by discipline in this subsection. A discussion of these three projects follows.

(1) Palo Verde-Devers 500-kV Electrical Transmission Line

Southern California Edison (SCE) has proposed construction of a second 235-mile, 500-kV alternating current transmission line along their existing ROW from the Palo Verde Nuclear Generating Station (PVNGS) about 40 miles west of Phoenix, Arizona, to SCE's Devers Substation, 10 miles north of Palm Springs, California.

The proposed Pactex pipeline ROW and the existing SCE ROW are generally 5 miles or more apart, except in two sections:

(a) In the Palm Springs area (east of Banning, California) and continuing 80 miles east to Desert Center, California (adjacent to the Chuckwalla Valley).

(b) South of the Plomosa Mountains (east of the La Posa Plain, California) and continuing approximately 65 miles east to an area south of the Saddle Mountains in Arizona. The two ROWs appear to be less than 3 miles apart in this area.

The existing SCE ROW uses transmission line towers with a minimum aboveground height of 35 ft in California and 32.5 ft in Arizona. The second line will use a parallel set of towers and will involve widening the ROW to a total width of 330 ft from the existing width of 200 to 240 ft. The new SCE line is slated for construction startup in middle to late 1988. Although the proposed Pactex project is scheduled for a 1986 to 1987 construction period, the potential overlap of the Pactex and SCE construction schedules could result in some cumulative construction-related impacts. There would be no cumulative significant impact of the SCE and Pactex projects during the O&M phase.

A transmission line routing alternative could include avoidance of the Kofa region and use of the Celeron/All-American ROW. Cumulative impacts of this alternative have not been addressed because of a lack of available information at this time.

(2) Celeron/All-American Pipeline

The Celeron and All-American Pipeline Companies propose to construct a 1,200-mile pipeline that would transport OCS and other locally produced crude oils form the Santa Barbara and Santa Maria Basins through Emidio Station, California, to McCamey, Texas (BLM, 1984a, p. 4). The proposed Pactex ROW would parallel the proposed

Celeron/All-American ROW for a 650-mile segment between Blythe, California, and Pine Springs, Texas. Potential cumulative impacts discussed below could occur during construction and O&M phases because the two proposed pipelines would be a minimum of 30 ft apart along the two ROWs. The Celeron/All-American construction schedule is presently unavailable. There is potential for overlap with the proposed Pactex project.

(3) Future Planned San Pedro Bay Outer Harbor Developments

The Los Angeles and Long Beach Harbor Departments, in conjunction with the COE, have developed a master plan for providing facilities to meet the cargo-handling demands of the two ports to the year 2020. This draft 2020 Plan identifies a phased program of deeper channels and landfill developments and alternatives that would create 2,600 acres of new land when completed. The draft 2020 Plan consists of several documents (a feasibility study and two programmatic environmental documents) that were released as drafts for public review in July 1984. The ports are currently preparing the final environmental document which is anticipated to be complete by late 1985.

As programmatic documents, the development described in the 2020 Plan are on a conceptual basis, and it was not intended that the documents would be used for the issuance of specific permits for project implementation. Implementation of specific projects, under the plan, would require preparation of subsequent site-specific documents that would focus on issues relevant to the specific action.

As indicated in subsection 2.2.1.A.1 (Figure 2.1.1-1), implementation of the Pactex landfill and channel will initiate, and be consistent with, the first phase of the draft 2020 Plan.

The next planned development in POLA outer harbor is anticipated to be the south landfill project, a 340-acre landfill and associated channel. As proposed, a 70-ft-deep channel and basin would be dredged northerly from the Pactex channel to serve the south side of the POLA 190-acre landfill and the north and west sides of the south landfill. The south landfill would be created from the dredge material and would be contiguous with the Pactex landfill to form a total landfill area of 455 acres. The south landfill project would also include construction of a rock dike to fully contain the dredge material that would also protect the undiked slopes of the Pactex landfill. As proposed, a land transportation and utility corridor would connect Terminal Island with the south landfill. Efforts have been initiated by POLA to address the engineering, environmental, and land-use planning issues concerning the south landfill. When sufficient detail has been developed to define the south landfill project adequately, a separate project-specific environmental document will be prepared to analyze in detail the relevant environmental issues and cumulative impacts of this proposal.

The next phase of development in Long Beach Harbor is anticipated to be a 135-acre landfill at the south end of Pier J in the Port of Long Beach. An environmental document is currently under preparation by the Port of Long Beach. Cumulative impacts of the total outer harbor landfill and channel developments in POLA and the Port of Long Beach to the year 2020 are discussed in the draft programmatic environmental documents and are incorporated herein by reference (COE, 1984a-d).

Cumulative impacts were generally assessed for three scenarios:

(1) Construction and operation of the SCE Palo Verde-Devers transmission line and the Pactex pipeline.

(2) Construction and operation of the Celeron/All-American pipeline and the Pactex pipeline.

(3) Construction and operation of future San Pedro Bay outer harbor developments and the Pactex landfill and channel.

Cumulative impacts are more likely during the construction and operation phases of the Pactex and Celeron/All-American projects than Pactex and the SCE project for impacts relating to geologic and seismic hazards, oil spills, surface water, and groundwater contamination. Temporary or long-term cumulative impacts in areas of transportation, air quality, soils, construction housing, land use, and recreation would not be significant. During construction, cumulative adverse impacts between the proposed Pactex project and the future outer harbor landfills and channels would be most pronounced in the areas of air quality, transportation, oceanography, marine biology, and noise. Long-term cumulative impacts would occur for geology and seismic setting, as well as cultural resources and paleontology.

The proposed Pactex landfill is consistent with the draft 2020 Plan (COE, 1984a-d) and is addressed in this draft EIR/EIS as a stand-alone project.

Where applicable, the cumulative impacts of the proposed Pactex project and each of the other projects are discussed separately. Where cumulative impacts are the same, one discussion is given for impacts that overlap.

4.6.1 AIR QUALITY

Cumulative impacts resulting from the Pactex pipeline and the Palo Verde-Devers, Celeron/All-American projects would be very minimal. Because the construction impact from these projects is brief and transient in nature, there would be no cumulative effect. The operational impact would have only a slight cumulative effect because each project must comply with all applicable air quality regulations, including NSR. Each project would be controlled under NSR requirements specified by each state.

For the future outer harbor landfills, cumulative air pollutant emissions from concurrent construction activities of dredging, dike construction and landfill preparation and development may occur. As terminals on the new landfills are constructed, cumulative impacts from operation and

transportation emissions could result in significant air quality impacts to the South Coast Air Basin.

4.6.2 GEOLOGIC AND SEISMIC SETTING

The proposed Pactex pipeline would use a segment of the utility corridor for the Palo Verde-Devers transmission line; however, no impact to the geologic environment was described for this project (BLM, 1979, pp. 3-8). The transmission line would be subject to some of the same geologic hazards as the proposed pipeline, including the fault and ground motion potential associated with the San Andreas fault near Indio. Both systems would also be exposed to slope instability in the Dome Rock Mountains and Plomosa Mountains of western Arizona. The interaction of these geologic hazards with the Pactex pipeline and the Palo Verde-Devers transmission line could result in cumulative impacts caused by oil spills and fire potential resulting from a catastrophic event such as a major earthquake.

The Pactex pipeline would follow the same corridor as the All-American pipeline between Blythe and Pine Springs. The major geologic hazards along this route include landslide potential and some minor fault rupture potential. Any landslide or fault rupture large enough to damage the Pactex pipeline would probably also damage the All-American pipeline. This would be a significant cumulative impact.

Dredge and fill operations for the future outer harbor landfills would result in a major alteration to the harbor bottom topography. There may be a cumulative increase in the risk from seismic hazards, including liquefaction potential while additional landfills and terminals are constructed.

4.6.3 SOILS

The cumulative impacts to soils associated with the Palo Verde-Devers transmission line would be increased erosion and soil loss relating to both projects. The ground disturbance caused by Pactex would be greater than the Palo Verde-Devers project; thus, the cumulative impacts would not be significant.

The cumulative impacts associated with the All-American pipeline would depend on where the final ROW and construction ROW for Pactex were located. Assuming the worst case, Pactex would use an alignment closely parallel to the All-American but with no overlap of disturbed areas. Thus, the cumulative impacts could represent approximately twice the soil erosion and soil loss potential of one project alone (assuming essentially the same construction techniques). However, implementation of construction and use plans and other erosion control techniques would make these impacts not significant.

Cumulative impacts to soils of the future harbor landfills would be limited principally to the dredging of harbor bottom soils to create deepwater channels and the use of the dredge material as fill.

4.6.4 SURFACE WATER

The cumulative impact associated with the Palo Verde-Devers transmission line would be negligible. No construction activity would take place in stream channels. However, some minor increases in turbidity at the Colorado River could result from runoff from disturbed areas adjacent to the river. This impact on water quality would be dissipated by the time the Pactex pipeline is constructed.

The cumulative impacts associated with the All-American pipeline would be longer periods of turbidity associated with construction through stream courses. These periods would be separated in time, however, and the residual effects of the All-American construction would be gone by the time the Pactex pipeline would be constructed. The synergistic impact resulting from oil spills is potentially very significant. The likelihood of small leaks developing in both pipelines from system failure (e.g. corrosion or seam failure) in the same stream, however, is judged to be low. The highest potential for oil spills is from a major rupture resulting from a very large scour event (>100-year) or rupture caused by earthquake-induced ground failure. Any such event that would rupture one pipeline would probably rupture the other, thereby causing an extremely adverse impact on the stream because of the large volume of oil spilled.

Cumulative impacts to surface water from construction or operation of future outer harbor landfills in POLA would not be anticipated.

4.6.5 GROUNDWATER

No substantive impact to groundwater is expected during construction from the Pactex, All-American, or Palo Verde-Devers projects. The impact during operation could occur only from the Pactex and All-American pipelines as a result of oil spills. It is unlikely that leaks would develop from both pipelines in the same groundwater basins over the life of the project. However, there would be a proportionately increased risk of oil spills and contamination of aquifers over the entire Blythe-to-Pine Springs pipeline segment. There is some potential for fault rupture or liquefaction-induced ground failure over this pipeline route. The probability is low of such an event causing pipeline rupture between Blythe and Pine Springs. However, if such a rupture were to occur, the cumulative impacts of both pipeline spills would be highly significant, particularly if the spills were to occur in sensitive groundwater basins.

Cumulative impacts to groundwater from construction or operation of future San Pedro Bay landfills would not be anticipated.

4.6.6 FRESHWATER BIOLOGY

The possible cumulative impacts to freshwater biology would be a result of multiple pipeline crossings at waterways. Concurrent construction of multiple pipelines would increase the magnitude of impacts and the area impacted. The cumulative operational impacts would occur by increasing the potential for oil spills and by increasing the magnitude of a spill if both pipelines were to be damaged by a major catastrophic event such as an earthquake.

Cumulative impacts to freshwater biological resources from construction or operation of future outer harbor landfills in POLA would not be anticipated.

4.6.7 TERRESTRIAL BIOLOGY

The construction and operation of both the Palo Verde-Devers transmission line and the Pactex pipeline would result in cumulative impacts to vegetation and wildlife from the Coachella Valley to the Chuckwalla Valley in California. These projects would be constructed in the same general location in this area. Assuming a worst-case scenario (that each project would be constructed on a separate ROW), a corridor up to 300 ft to 340 ft wide could be created in areas where towers occur. Construction of these projects would result in the loss of wildlife habitat and desert vegetation. The cumulative adverse impacts from construction would certainly be unavoidable to sensitive desert species, including the flat-tailed horned lizard, desert tortoise, and Coachella Valley milk vetch (a plant). Both the proposed route and the Coachella Valley alternative would adversely impact the Coachella Valley fringe-toed lizard. However, the alternative would avoid critical habitat of the species.

The construction and operation of the Pactex pipeline and the All-American pipeline would be in the same general location from Blythe, California, to Pine Springs, Texas. A corridor of disturbance up to 200 ft wide could be created. Construction of these pipelines would result in loss of wildlife habitat and vegetation, as well as adverse impacts to sensitive species (particularly to desert bighorn sheep) along the route (see subsections 3.2.7.D and 4.2.7.D). An additional disturbance to desert bighorn sheep from pipeline maintenance activities could occur in the Plomosa Mountains. Secondary impacts to wildlife may occur from new and improved access roads to areas previously having limited access. This may result in increased poaching, shooting of raptors, and habitat destruction from offroad vehicle use.

Cumulative adverse effects could result from concurrent or contiguous construction of the two pipelines in the form of increased noise and human disturbance, increased physiological stress, and increased disruption of normal movement patterns. These effects would be particularly important if they occurred in critical habitats at critical times of the year for sensitive species. Additional riparian vegetation disturbance would occur at stream crossings as a result of construction of both projects.

Implementation of the outer harbor landfill projects would not result in cumulative adverse impacts to terrestrial biology. As landfills are built, new terrestrial habitat in the ports would be created. This new habitat would be expected to be similar to existing terrestrial habitats (principally weedy and pioneer species) in the harbor area and would support similar biotic communities. As terminals become operational on the landfills, it is not likely that there would be any significant long-term adverse or beneficial impact to terrestrial flora and fauna of the area.

4.6.8 SOCIOECONOMICS

Employment requirements, housing needs, transportation needs, income earned by construction workers, and increased tax benefits would be interrelated. The Pactex project would employ up to 1,500 workers residing locally, 1,600 workers from outside the local area, and would generate about $3.62 million per week in wages. This project would increase the tax base in La Paz/Yuma, Pinal, and Cochise Counties in Arizona and Hudspeth County, Texas, by 10% to 15%. No long-term employment impact would be experienced because of a small operations and maintenance work force.

The Pactex and Celeron/All-American projects would compete for local employment and housing along an 800-mile route from Blythe, California, to the Midland/McCamey, Texas areas. Pactex's total employment along this route is estimated at 1,540 workers, compared to 1,220 for the Celeron/All-American. The construction spread regions over this route segment are the same for the two proposed projects in some cases. For example, in the Blythe, California, to Coolidge, Arizona, construction spread region, the peak construction work force would total 512 workers for Pactex and 528 for Celeron/All-American. The nonlocal labor force would amount to 358 workers for Pactex and 370 workers for Celeron/All-American. Similar impacts would occur in other construction spread regions. Housing requirements (rental units and hotel/motel units) for Pactex in the Blythe-Coolidge spread region are estimated at 244, while Celeron/All-American would require 251 units. Therefore, the simultaneous construction of the Pactex and Celeron/All-American projects would double the impact on employment and housing caused by the construction of a single pipeline.

The Palo Verde-Devers 500-kV transmission line project could parallel the construction efforts of Pactex in the western portion of the Blythe-Coolidge construction spread region. The peak construction work force for this project is estimated at 354. Although no figures are available regarding associated housing requirements, they would be in the range of 150 to 200 units. Cumulative employment would total an estimated 3,350; total housing demand could range from 640-700 units.

The cumulative impacts of the future outer harbor developments would result in significant beneficial impacts of increased employment, industrial production, wages, business revenues, and taxes. These will result as direct and indirect effects of both construction and operation. There would be a cumulative adverse impact on the anchovy bait fishery as available open areas are reduced. The cumulative loss of anchorages would reduce revenues for anchorage fees to the ports and would reduce the areas available for bunkering. Growth in the harbor area will result in increased demand for housing and public services.

4.6.9 LAND USE AND RECREATION

The implementation of both the proposed Celeron/All-American and the Pactex pipeline systems would result in cumulative impacts to land use and recreation. The impacts would be associated primarily with the construction and operation of the pipeline component of the two projects. Short-term disruption of current land use would occur along the pipeline ROWs during

construction. The presence of both pipelines would increase the possibility of oil spills into streams, creating a greater potential for disturbance of water-oriented recreation.

The cumulative impacts on land use and recreation associated with construction and operation of the Palo Verde-Devers transmission line and the Pactex pipeline would be minimal. Short-term construction impacts would be greater in areas where the ROW corridors of the two projects coexist. Long-term cumulative impacts would not be anticipated.

Cumulative impacts of future outer harbor developments would result in decreased water area availability for anchorage, vessel movement, and recreational uses. Land would be developed with facilities to accommodate the increased cargo-handling demands. These cargo types would include: breakbulk, container, automobiles, petroleum, other liquid bulk, and dry bulk. Existing and/or new port tenants may be relocated or assigned to new landfill areas in accordance with Port Master Plan provisions.

4.6.10 TRANSPORTATION, ENERGY, UTILITIES, AND PUBLIC SERVICES

Overlapping construction activities by Pactex and Celeron/All-American would produce cumulative impacts in the crossing of roadways, railroads, and rivers. In the case of highway crossings, the amount of heavy construction equipment being either transported along or across the roadway would double. This would increase the risk of accidents, increase highway congestion, and cause additional delay to vehicular traffic flows. The number of employee vehicles would also double, adding an increased load to existing highway capacity. However, because this would be a short-term situation, this would not be considered a significant impact.

The Palo Verde-Devers Project would also require the use of some heavy equipment, but because there would be no trenching operations or the laying of pipe, considerably less equipment would be required. The cumulative impact of the Palo Verde-Devers Project on the Pactex project would not be significant. Road traffic activity relating to employee travel would also not be significant.

Cumulative impacts could also occur in the area of marine traffic because of the simultaneous operations of the proposed Pactex and Celeron/All-American projects. Tankers transporting crude oil from Alaska, California, crude oil production areas, and possibly from foreign locations to two pipeline terminals in California would impact the trafffic level and pattern in the Santa Barbara Channel. This could result in 4 to 8 additional tanker movements per day in the channel over the current level.

Implementation of proposed outer harbor landfill projects would incrementally add to demands on the transportation systems (rail, vessel, vehicular, and pipeline) as facilities become operational. Placement of landfills would permanently alter the existing marine traffic circulation pattern. Adverse impacts on marine traffic in the outer harbor would result from increased vessel activity for cargo transport while decreasing the available water area with a concomitant increase in vessel congestion. Many existing anchorages would be eliminated; new anchorages would have to be designated.

Dredging the channels would allow deep-draft vessels to call on terminals constructed on the new landfill. Because it is anticipated that some existing hazardous liquid bulk cargo facilities may be relocated to the landfills in outer harbor, there would be reduced transit of larger liquid (and dry bulk) vessels into inner harbor areas to load/discharge cargoes.

Specific impact analysis and mitigation options for rail and vehicular traffic impacts are addressed in the San Pedro Bay Ports Transportation Study (COE, 1984e) and in the San Pedro Bay Ports Access Study, Phase 1 and 2 (SCAG, 1984).

With respect to the cumulative energy impacts, the Celeron/All-American pipeline would increase the local demand for electric power required for pumping stations from Blythe, California, to Pine Springs, Texas, over and above that required by the Pactex project. If construction of the landfill island and the San Pedro Bay outer harbor should overlap, a substantial increase in power for the electrically driven dredges would be required over that needed by the Pactex project.

4.6.11 CULTURAL RESOURCES

The cumulative effects on cultural resources involve aggregate effects created by the proposed action with those of existing facilities and activities, as well as those of other future projects in the area. For the proposed Pactex project, the cumulative effects that pertain to the pipeline corridor include:

(1) Stream channelization
(2) Urban and agricultural development
(3) Road and railroad construction
(4) Existing and proposed oil pipelines
(5) Repeated excavation of some sites
(6) Continuing indirect effects of erosion and uncontrolled removal

The proposed Pactex pipeline would incorporate many existing ROWs for flood control, transportation (rail and road), and other petroleum carriers. In this manner, the overall new adverse effects to the mile-wide corridor would be restricted; however, the effects along the conforming ROWs would be intensified. Because a second pipeline project and the Palo Verde-Devers transmission line are proposed along the conforming sections of the Pactex project corridor, additional effects would accumulate and would intensify the adverse effects on cultural resources along the ROW by previous construction. The All-American pipeline project and the Palo Verde-Devers project may require extensive mitigation of adverse effects and surveys/protective measures for archaeological and historic features along the Pactex corridor. Therefore, significant effects could arise from repeated archaeological excavations on the same sites and would be intensified by pipeline and powerline construction and access. However, some scientific benefits may arise from the cumulative results of mitigation by combinations of the three projects.

If the mitigation measures are similar for the Pactex and All-American pipeline projects and for the powerline project, then the direct impacts would be reduced along the entire lengths of both pipeline corridors if both projects used the same plan and survey. Where both pipeline and powerline corridors conform, the mitigation measures of the first pipeline or powerline construction should eliminate the need for further testing, if the mitigation measures for the first pipeline address the total site and not just the area subject to direct impact. Reduction of removal and excavation would lessen some adverse effects of mitigation programs of the subsequent pipeline and powerline. If mitigation is complete along the entire route, the significant adverse effects could be eliminated by the avoidance or scientific recovery and recordation of historic and archaeological remains.

Dredging and landfilling for future outer harbor landfills may result in cumulative impacts to sites. There would be an impact on shipwreck sites in the outer harbor that will be evaluated for NRHP eligibility. If any significant resources are discovered, a mitigation program for significant submerged resources would be implemented with concurrence from COE and SHPO.

4.6.12 PALEONTOLOGY

Onshore, the proposed Pactex pipeline would be designed to incorporate many existing ROWs for flood control, transportation (rail and road), and other petroleum carriers. In this manner, the overall new adverse effects to the mile-wide corridor would be reduced; however, effects along the conforming ROWs would be intensified as described in subsection 4.6.11.

If the mitigation measures are similar for the Pactex and All-American pipeline projects and for the powerline project, then the direct impacts would be reduced and perhaps locally eliminated along much of both pipeline corridors, particularly where the same access roads would be used for more than one project. Where pipeline and powerline corridors overlap, the mitigation measures of the first pipeline or powerline construction may reduce or eliminate the need for further mitigation. Reduction by removal of fossils would lessen some construction effects of earlier pipelines and the adverse mitigation effects for the subsequent pipeline. If mitigation is complete along the entire route, many of the adverse effects could be reduced or eliminated by the avoidance or scientific excavation/recordation of paleontologic resources, except within the construction zone.

Cumulative impacts on paleontological resources from the future landfills and channel dredging include potential impacts to fossils that may exist in the harbor bottom sediments.

4.6.13 VISUAL RESOURCES

Visual impacts would occur where the Pactex and All-American pipeline ROWs lie along established pipeline corridors with existing surface scars. The cumulative effects of the new pipeline ROWs would potentially compound the changes created by existing pipelines. Aboveground facilities would be intrusions to the visual environment. Separating these facilities and placing them in areas with low scenic quality would reduce the cumulative effects of the two projects.

The greatest potential for impacting the visual environment from the implementation of the Pactex pipeline and the Palo Verde-Devers transmission line projects would occur if the Pactex aboveground pumping facilities were to be placed within the viewshed of the Palo Verde-Devers transmission towers. Placement of both projects in proximity to each other would compound the intrusiveness of these facilities on the visual environment.

Loss of open water areas due to outer harbor landfills and intensified industrial development of these fills would result in cumulative adverse impacts to visual resources. Although highly subjective, open water views of the harbor can be considered generally to be of a higher aesthetic quality than views of an industrialized port complex.

4.6.14 NOISE

Because of the short duration of construction activities and the lack of noticeable noise impacts during operation, no cumulative noise impact would occur as a result of constructing the Celeron/All-American, Palo Verde-Devers transmission lines, and Pactex pipeline. Implementation of the outer harbor landfill projects may result in cumulative adverse noise impacts. Although facilities would be constructed on fills removed from sensitive noise receptors, there will be increased traffic in and around the port's area as a result of increased port activity. Employees at the new facilities would also be exposed to varying levels of noise.

4.6.15 OCEANOGRAPHY AND MARINE BIOLOGY

The proposed landfill island is consistent with the draft 2020 Plan (COE, 1984). Cumulative impacts of future landfills in the harbor are addressed in the draft 2020 Plan. Potential cumulative impacts to oceanography and water quality include long-term changes in tidal circulation pattern, tidal velocity, flushing rate, harbor resonance, and water quality. Physical and numerical modeling studies of the proposed landfills were conducted by the COE for the total 2020 Plan development. These analyses showed that the current velocities and tidal flow rates would remain relatively constant for most of the harbor area. However, there would be significant declines in tidal velocity and tidal flow volumes at the entrances to the harbor that would increase the residence time of water in the harbor. Impacts to water quality could result in increased fluctuations in means and extremes of temperature, DO, salinity, nutrient concentrations, and transparency.

Implementation of the 2020 Plan would incrementally decrease marine habitats and biota in the harbor. Benthic habitats, which would be filled or deepened, would be particularly impacted. Impacts to fish abundance and bird foraging and resting habitats would also result. Mitigation measures would be undertaken in connection with specific projects for net impacts to habitats and biota.

4.6.16 SYSTEM SAFETY AND RELIABILITY

There would be no cumulative impact on system safety and reliability during the construction phase of the proposed Pactex project. Potential significant cumulative impacts during O&M would be restricted to seismic hazards and fires/explosions. The cumulative impact of fault movement would be less than the impact from ground shaking (subsection 4.2.16). The probability of fire or explosion for each pipeline system is 0.11 fire/explosion per project lifetime (as determined by the OIW and reported in subsection 4.2.16). This risk results in a cumulative probability of 0.012. Other events with little or no implication for cumulative environmental impact include the temporary loss of power or the loss of communication.

Cumulative impacts resulting from proposed harbor landfill projects relating to seismic and fire/explosion hazards could result from construction and terminal operation activities. These would also be cumulative impacts to marine vessel traffic. Siting of hazardous liquid bulk facilities in more remote locations would result in enhanced safety.

4.6.17 OIL SPILL POTENTIAL

In areas in which the proposed Pactex pipeline is proximate to the Celeron/ All-American pipeline, there is a possibility for cumulative oil spill impacts. This is particularly true for common stream crossings in the event of unusual storm-induced scouring incidents and for incidents relating to seismic activity. Project design criteria for seismic protection and stream crossings would reduce the frequency of spills caused by storms and earthquakes; planned mitigation measures would minimize the impacts of any spill that might occur. Potential oil spill cumulative impacts are addressed separately in subsections on geology, terrestrial and freshwater biology, groundwater and surface water, and land use. As facilities are developed on the new landfills, there would be cumulative impacts to the potential for oil spills. However, a possible reduction in oil spill potential could result from consolidation/relocation of hazardous liquid bulk facilities in accordance with port's Master Plan provisions.

4.7 MITIGATION MEASURES

The following mitigation measures have been developed to alleviate the adverse impacts that were identified earlier in this section. Where impacts were considered minor or of a short duration, no mitigation measure was developed.

In addition to the mitigation measures contained in this EIR/EIS, the BLM would attach standard and special ROW stipulations to its ROW grant. These stipulations would contain generic measures that are applied to all ROWs, as well as site-specific measures whose need may be identified at the time the pipeline centerline is surveyed. For example, the required surveys for cultural resources and protected animals would probably identify the need for site-specific stipulations.

Federal agencies (BLM, COE, Forest Service, FWS, and DOD) can enforce mitigation measures and stipulations on Federal and private lands that are affected as a result of a Federal action.

Planned mitigation measures presented in subsection 4.7.1 are those that are anticipated to be implemented. Some of these measures have been committed to by Pactex; others are reasonably expected to be permit requirements of at least one of several permitting agencies. The mitigation measures that BLM anticipates requiring as stipulations in its ROW grant are indicated as planned measures. Other measures that could be used to mitigate impacts are listed in subsection 4.7.2 as available mitigation measures.

4.7.1 PLANNED MITIGATION MEASURES

A. Air Quality

A number of air pollution mitigation measures have been identified that would result in lowering air pollutant emissions and impacts. The following measures have been incorporated into the latest project design. Mitigation measures along with their effectiveness are presented below:

(1) Use low-sulfur (0.05%)/low-nitrogen diesel fuel in California for construction equipment and optimize the air-to-fuel ratios for each piece of equipment to minimize the formation of NO_x compounds. The construction contractor will operate each piece of equipment at its optimum air-to-fuel ratio.

- Effectiveness: Diesel fuel typically has a 0.2% weight sulfur content. The use of the lower sulfur fuel, as agreed to by Pactex, would result in approximately a 75% reduction in sulfur emissions. The use of low nitrogen fuel and optimized air-to-fuel ratios would result in a 30% to 40% emission reduction (SCAQMD, 1985).

(2) Use electrically driven welding and pipe-wrapping machines to the maximum extent possible in the berth and terminal areas.

- o Effectiveness: These measures represent an agreed-upon BACT with the SCAQMD. They would effectively eliminate most emissions (nearly 100%) associated with this equipment.

(3) Use floating-roof sump tanks instead of fixed-roof tanks.

- o Effectiveness: The use of floating-roof sump tanks will result in a VOC emission reduction of about 40% (Pactex, 1983b).

(4) Use innovative emission control devices at POLA to reduce the tanker emissions to less than NSR threshold levels (see Appendix A).

- o Effectiveness: By collecting and treating the flue gases generated by tankers operating at berths, the following emission reduction levels should be achieved:

Pollutant	Emission Reduction (%)	Emission-Reduction Device
NO_x	90	Selective catalytic reduction system
SO_2	90	Scrubber
Particulate	70	Electrostatic precipitator
ROG	90	Combustion
CO	90	Combustion

(5) Under the SCAQMD NSR regulations, offset the ROG emissions calculated to be over the threshold limit (Pactex has obtained necessary offsets).

- o Effectiveness: This measure would result in lower ROG emissions from sources not associated with the pipeline. Because offsets would be required at a ratio of greater than 1:1, decreases in emissions and a net air quality benefit would occur.

(6) Use fugitive dust control measures during construction. An onsite inspector would assess the need for dust suppression. This measure would include water spraying with dust-suppression additives.

- o Effectiveness: This measure would result in a reduction in fugitive dust of approximately 50% (EPA, 1977). These emissions are short term and would be limited to a 45-hour-period per week.

(7) Use electric hydraulic dredges for major dredging activities.

- o Effectiveness: This measure would eliminate combustion emissions associated with the dredging operation.

B. Geologic and Seismic Setting

(8) Mitigate potential oil spills at known active faults by using mechanical design, supplemented by the use of seismic detection instruments. This system would transmit an alarm to the dispatcher so that the pipeline may be shut down until an onsite investigation has been made.

- o Effectiveness: In the event of an oil spill caused by fault rupture, this system would provide quicker system shutdown, thereby reducing the volume of oil spilled.

C. Soils

(9) Implement special measures described in Appendix B for Federal lands in the BLM Carlsbad Resource Area.

- o Effectiveness: These measures would minimize certain impacts specific to Federal lands.

D. Surface Water

(10) Develop an oil spill control and countermeasure plan.

- o Effectiveness: This plan would include procedures for oil spill cleanup at river crossings.

(11) Treat discharge dewatering wastes by using detention ponds or other means to reduce sediment loads and chemical contaminants into streams where necessary.

- o Effectiveness: Sediment loads from these sources would be minimized.

(12) Install a vibration-detection system proposed by Pactex at major stream crossings to detect impacts to the pipeline resulting from severe scour events. This instrumentation would alert pipeline operators of an impending failure and would allow pipeline shutdown. The block valve on the upstream side of the crossing would be closed, and a local crew would be dispatched to the site with spill containment and cleanup equipment.

- o Effectiveness: This measure would be limited to the amounts between the block and check valve as shown in Table 4.2.17-11.

(13) Install block and check valves at the following stream crossings: Los Angeles River, San Jose Creek, San Timoteo Creek, Colorado River, Gila River, Wild Cat Canyon Creek, Bass Canyon Creek, Rio Grande, and Pecos River. Install a block and check valve at the San Pedro River.

- o Effectiveness: This measure will reduce the volume of oil potentially spilled into these streams.

E. Groundwater

No planned measure.

F. Freshwater Biology

No planned measure.

G. Terrestrial Biology

(14) On public lands, require a field survey by a botanist where existing data indicates that sensitive plant species or communities (including but not limited to the palm oasis) may occur in the construction ROW. Alter pipeline route or transplant plants to avoid destruction.

- o Effectiveness: This measure will eliminate losses of known sensitive plant species.

(15) On public lands prior to construction, have a qualified biologist survey all potential raptor habitat within 0.5 mile of the pipeline and great blue heron rookeries near the ROW in the Carlsbad Resource Area. Identify active and inactive nests. Do not permit construction within 0.5 mile of active eyries during the nesting season (February 1 to June 15 for raptors). Permit construction near inactive nests; do not disturb nests.

- o Effectiveness: This measure will prevent nest abandonment resulting from pipeline construction and will provide flexibility for construction scheduling.

(16) Do not permit construction in the Plomosa Pass area during the January-to-March lambing period. Mitigate any effect on bighorn sheep water resources through avoidance or through construction of new wells or collectors.

- o Effectiveness: This measure eliminates the impacts on bighorn sheep in the Plomosa Mountains during the lambing period.

(17) Reduce construction widths to 50 ft in CVFTL habitat in the Coachella Valley. Use existing roads whenever possible. Minimize use of support vehicles.

- o Effectiveness: This measure will reduce the loss of the Coachella Valley fringe-toed lizard. Impacts to other sensitive species in the area will also be reduced.

H. Socioeconomics

No planned measure.

I. Land Use and Recreation

On Federally managed lands, all damages to range improvements acquired directly from the construction of the Pactex pipeline will be repaired to the original condition prior to construction, or replaced if damages are such that 100% of its use cannot be salvaged. This will be negotiated by all parties affected by such damages and agreed on by them.

Effectiveness: This measure would restore range improvements to preconstruction conditions.

J. Transportation, Energy, Utilities, and Public Services

(18) Continue the policy started in 1983 that all new pilots employed by the LAHD undergo an extensive training program including piloting of supertanker-sized vessels (drafts over 40 ft) under supervised performance. The normal procedure is for pilot trainees to progress to larger vessels warranted by their ability and performance.

- o Effectiveness: This program will provide a cadre of pilots experienced and familiar with piloting large vessels comparable in size to those that Pactex antcipates operating.

(19) Adhere to existing requirements imposed by the LAHD Pilot Station that dictate the conditions governing the piloting of large vessels. These requirements include:

(a) One-way traffic movements in the shipping channel in use.

(b) Visibility of 1 mile.

(c) Minimum number of tugs required.

(d) Wind speed conditions.

(e) Minimum underkeel clearance of 10% at Angel's Gate.

(f) For tankers at berth, maintaining a minimum of 15% power for emergency exiting.

- o Effectiveness: This measure will provide safer operation of large vessels in POLA.

(20) Publish information to pilots regarding planned construction activities and locations in the USCG Notice to Mariners and add to navigation charts. Pilots entering or leaving the harbor could decide in advance whether to reduce normal speed or to use a less-direct routing if required.

- o Effectiveness: This action will serve to maintain smooth vessel traffic flows in the construction area.

(21) Place the dredge, construction materials, and vessels/barges to minimize the impacts to vessels passing into/out of the harbor.

- o Effectiveness: This measure will minimize delays to commercial vessel traffic by localizing all aspects of port construction activity.

K. Cultural Resources

The BLM and COE are considering issuing Federal permits for the project. In that capacity, they will require as a minimum that all mitigation measures indicated below are implemented. The BLM will enter into negotiations with the SHPO in each state and with the Advisory Council on Historic Preservation and will enter into a Memorandum of Agreement (MOA) with those offices. The BLM and COE will enter into an MOA in those areas where COE has permit jurisdiction. This will ensure that BLM and COE are in compliance with the law and that cultural resources are fully considered under the law. These measures are considered by BLM to be minimum requirements and may increase when the MOA is negotiated.

(22) Conduct surveys on Federal land, adjacent private lands (see item b below), and highly sensitive private lands (see item c below) to identify significant cultural resources and mitigate adverse impacts to sites listed on or eligible for listing on NRHP. Private lands can be surveyed and mitigation measures implemented only with landowner consent. The mitigation measures form the following integrated program:

(a) Prior to construction and all surface disturbing activities, Pactex would have conducted and submitted for approval an intensive cultural resource survey on all Federal land surfaces. As determined by the authorized officer, previous surveys on some lands may be adequate, and such lands need not be resurveyed. Overview reports may need to be updated when the final alignment of the ROW is determined.

(b) Where Federal lands are adjacent to private lands, Pactex would conduct a cultural resources field inventory of the ROW on private lands using the same field inventory standards applied to Federal lands. The inventory shall be conducted only with the landowner's consent. The inventory would cover the ROW for at least 1 mile from the point at which the ROW enters private land. The 1-mile stipulation would apply to both the entry point and the exit point on private lands. If cultural resources are encountered that, as individual sites or as part of a larger site complex, would qualify for listing in the NRHP, the ROW inventory should be extended beyond this mile, if necessary, until the boundaries of the site or site complex are fully delineated. If the private landowner expressly denies consent for a cultural resources field inventory, Pactex would use its best efforts to conduct its operations in a manner that would avoid adverse effects on any property encountered during construction that is listed or that may be eligible for listing in the NRHP.

(c) Based on information compiled in the cultural resources overview technical reports, a field evaluation is required of known cultural sites that are located on private lands within the ROW and that are likely to have National Register potential to determine whether they would qualify for listing in the NRHP. Such a field evaluation should be updated using the appropriate site record forms. A field inventory is required in specific locations on private land within the ROW that are included in high sensitivity areas delineated in the overview reports and that are expected to contain NRHP-eligible properties. The determination of which specific locations warrant such an inventory will be made by the authorized officer in consultation with the SHPO of the appropriate state.

(d) The survey would include a 200-ft corridor centered on the construction ROW. Pactex may choose to survey a wider corridor in some or all areas to enhance the potential for avoidance. The survey interval shall be no greater than 100 ft between transects. The centerline of the corridor would be flagged by the pipeline company prior to the survey.

(e) All Federal land surfaces and other lands as required that would be disturbed by construction or used in construction (e.g., tank farms, pumping stations, insulating yards, access roads, borrow pits, or power lines) would be inventoried to the same standard as above, including a 100-ft buffer zone on all sides of the property that would be impacted. All areas would be flagged by the company prior to the survey.

(f) Where cultural resources are located during the survey, the inventory area would be expanded as necessary to fully delineate the boundaries of the resources and to explore the potential for avoidance. Where appropriate, a post-hole digger or auger may be used to determine whether subsurface deposits are present.

Sufficient information must be obtained at the time of survey to determine whether sites are potentially eligible for inclusion on the NRHP. Criteria for determining NRHP eligibility are found in 36 CFR 60.4. Limited testing of subsurface deposits may be needed for a limited number of sites.

(g) All cultural resources encountered during the course of the inventory would be recorded on site forms acceptable to each appropriate Federal or other jurisdiction and to the SHPO of the appropriate state.

(h) Isolated (nonsite) diagnostic artifacts would be recorded as encountered and collected when required at the time of the survey.

(i) All previously recorded sites that occur within the construction ROW or other areas that would be impacted by construction would be field checked to determine potential for eligibility for inclusion on the NRHP. Site records would be updated using forms approved by the Authorized Officer. Sites that have already been officially determined to be ineligible would not be rechecked.

(j) For that portion of the pipeline on Fort Bliss, Texas, identification of historic resources requirements and consultations specified by applicable law and regulation would be the responsibility of Fort Bliss. Artifacts recovered on Fort Bliss would be the property of Fort Bliss, and they would be curated on the installation. Historic resources standards and requirements would be based on the Fort Bliss Historic Preservation Plan, the installation's programmatic compliance with 36 CFR 800.

(k) The SHPO in each state and the Advisory Council on Historic Preservation would have an opportunity to review the final survey report. The report would include the results of the survey with eligibility determinations on all sites, as well as a mitigation plan for sites that are determined to be eligible for the NRHP. During the review period, a scope of work for the pipeline company for the mitigation phase of the project would be prepared. The scope of work would be based on the mitigation plan. Mitigation may include avoidance, surface collection, excavation, or monitoring. All data recovery activities must be completed prior to construction.

(l) After completion of all fieldwork, a progress report would be submitted summarizing fieldwork and mitigation. Upon receipt and approval of the progress reports, notices to proceed would be issued.

(m) If previously undiscovered cultural resources are uncovered during constructon, work would stop and a competent archaeologist would be called in to evaluate the site. If necessary, mitigation would proceed as above.

(n) Contact would be maintained with appropriate Native American Groups to determine the nature and extent of concerns regarding specific cultural resources. Native Americans would be notified prior to data recovery consistent with Federal and all other agency requirements.

(o) In situations where site boundaries are ambiguous and close to impact areas, an archaeological monitor and Native American observer should be present. If potentially significant cultural materials or features are encountered, they will be preserved either by realignment of the proposed facilities or by prompt evaluation and recommendations for any necessary mitigation measure.

(p) Fence significant cultural resources subject to indirect impacts during construction with further evaluation during operations.

- o Effectiveness: Where these measures are followed, cultural resources would be protected where prudent and feasible. These actions, and consultation under Section 106 of the National Historic Preservation Act, would ensure that the effects of the pipeline construction and operation on cultural resources are fully considered as required by law.

(23) The COE will require a 100% inventory of cultural resources within its permit area of the harbor as it is affected by the Pactex project.

- o Effectiveness: Where these measures are followed, cultural resources would be protected where prudent and feasible. These actions, and consultation under Section 106 of the National Historic Preservation Act, would ensure that the effects of the pipeline construction and operation on cultural resources are fully considered as required by law.

L. Paleontology

The proposed mitigation program will include planned measures for reducing impacts to highly important paleontologic resources on Federal land, as well as available measures (discussed in subsection 4.7.2) for reducing impacts to moderately important resources on Federal land and highly and moderately important resources on local agency and private land.

The levels of mitigation effort for various parts of the 1-mile-wide corridor and the ROW are proportional to the importance of the resource but also reflect the type of impact. Direct impacts occur almost entirely in the ROW and require a higher mitigation effort in important areas; indirect impacts are more important in the rest of the corridor. Areas containing highly important paleontologic resources would require a high mitigation effort; areas with moderately important resources would normally require a moderate effort (described in subsection 4.7.2.L); areas of little or no importance would usually require no mitigation effort. (The levels of significance are defined in subsection 3.2.12.) Areas and formations of moderate to high importance and direct impacts and the magnitude (in acres) of these impacts are summarized in subsections 3.2.12 and 4.2.12 and are described in the Pactex paleontologic resource technical report (Lander, 1985). The scope or magnitude of the total mitigation effort would be determined by the total of moderately and highly important areas, by the amount of direct and indirect impacts to these areas, and by agency jurisdiction and requirements. Areas of moderate to low or no importance could be found to have comparatively more important resources locally that would require raising the importance of the immediate area of the resource and correspondingly increasing the mitigation effort.

The mitigation program would be formulated prior to any construction activity and would be based on the results of the data search summarized in the Pactex paleontologic report (Lander, 1985) and subsequent searches required as the result of recent and possible future realignments. The program would be responsive to all Federal and local agency mitigation requirements for lands under their respective jurisdictions. Also, the program would be based on the geographic distribution of particular levels of resource importance, as represented by the distribution of fossiliferous and potentially fossil-bearing rocks of these same levels inside the corridor and within the ROW. The distribution of these levels of importance within the corridor and ROW would be determined by comparing geologic maps of the project area with maps and aerial photographs showing the proposed locations of the pipeline trench, pump stations, and new access roads. This review would determine where particular mitigation levels and tasks would be planned or available within the corridor and the ROW.

The BLM is considering the issuance of a permit to cross Federal land under the Mineral Leasing Act. The BLM would ensure that adverse impacts to highly important nonrenewable paleontologic resources and the loss of highly important scientific data on all Federal land be mitigated by requiring implementation of the migitation program described below.

(24) This mitigation program would greatly reduce the direct and indirect impacts (described in subsection 4.2.12) to highly important paleontologic resources in the corridor on Federal land. In these areas, an intensive preconstruction field survey of the corridor and ROW would be conducted to locate fossils that would be lost through construction activities and unauthorized collecting. All vertebrate fossil sites would be thoroughly collected and excavated, if necessary, to remove specimens. Representative samples of scientifically important invertebrate and plant fossils would be collected. All fossils collected would be documented in field records, and the sites would be documented on topographic maps and photographs. If possible, direct impacts to highly important sites would be avoided during construction of the pipeline, pump stations, and access roads. At least one paleontologic monitor would be stationed at each construction site during construction. If fossil remains were uncovered during construction, direct impacts to the site would be stopped until a qualified paleontologist has determined their importance, made recommendations regarding further mitigation, and initiated/completed these measures. Recommendations would include one or more of the following: site avoidance, no mitigation, excavation, or additional field survey of the immediate area, including the area beyond the ROW.

After completion of the fieldwork, fossils from particular areas and all supporting documentation would be deposited in designated repositories; the fossils would be prepared, identified, and curated; and results of the survey and monitoring, including lists of taxa collected from particular units, would be summarized in a final report (postconstruction effort).

- o Effectiveness: With the exception of avoidance of an entire area of concern, the comprehensive collecting of fossils during preconstruction surveys and construction monitoring (as recommended in the mitigation program) would be the most effective way of reducing adverse direct impacts to fossils, fossil localities, and fossiliferous and potentially fossil-bearing formations within the ROW, as well as the adverse indirect impacts elsewhere within the corridor in highly important areas. The proposed mitigation program would also ensure adequate data recovery/preservation. Overall, this program, if implemented, would greatly reduce adverse impacts to highly important paleontologic resources on about 12 miles (5 miles in California and 7 miles in Arizona) of Federal land, or 1% of the corridor length. However, this measure would not mitigate adverse impacts to highly important resources on non-Federal land.

M. Visual Resources

(25) For the BLM's Carlsbad Resource Area, paint all aboveground facilities sandstone brown and periodically maintain them in accordance with Federal standard 595-20318 or 03018.

- o Effectiveness: This will comply with Federal (BLM) standards.

N. Noise

No planned measure.

O. Oceanography and Marine Environment

(26) Perform a complete chemical analysis of dredge spoil to elucidate areas or lenses of sediments that might be contaminated by oil and grease, heavy metals, or chlorinated hydrocarbons. Determine the physical and chemical suitability of the fill for in-harbor fill disposal according to COE regulations.

- o Effectiveness: This measure will reduce potential water quality impacts.

(27) Require that any return water or dewatering liquids from dredge and fill activities meet a RWQCB standard of 1 mg/liter/h for settleable solids.

- o Effectiveness: This measure will reduce potential water quality impacts and maintain ambient water quality.

(28) Establish a monitoring program for settleable solids, DO, and transparency to discern dredge and fill impacts on water quality adjacent to the construction activity and at locations distant from the immediate area. A monitoring program is usually required and designed by the RWQCB.

- o Effectiveness: A monitoring program will indicate short-term water quality impacts that may require additional mitigation strategies during dredge and fill activities.

(29) Cut the dredge channel slopes at 3:1 to ensure stability of side and top slope areas unless the detailed geotechnical surveys recommend a different slope.

- o Effectiveness: Side slope areas with minimal bottom currents and a sandy regime should be stable with a 3:1 slope.

(30) Do not permit dredge and backfill activities for the pipeline in the area of shallow water habitat adjacent to the 190-acre landfill island during the April-to-September breeding season of the California least tern.

- o Effectiveness: This measure will reduce the potential impact for reduction of foraging habitat. Decreased utility of some foraging habitat may still occur because of the disturbance of fisheries.

(31) Treat the point source discharge of runoff water and water from the oil/water separator to comply with RWQCB standards.

- o Effectiveness: This measure will reduce the impacts on marine biota, water quality, and beneficial uses of the harbor.

(32) Require the point source discharge of scrubber effluent to meet existing or imposed RWQCB standards for temperature, pH, particulates, and sulfur constituents.

- o Effectiveness: This measure will reduce the impacts on marine biota, water quality, and benefical uses of the harbor.

(33) Require the scrubber intake to meet the 316-B requirements of the Federal Water Pollution Control Act (FWPCA) that the intake location, design, construction, and capacity reflect the best available technology for minimizing adverse environmental impact.

- o Effectiveness: Some phytoplankton, zooplankton, invertebrates, and fish will be entrained and killed by the intake system. Proper design of a sealguard and trash screen can maximize the bypass of fish in the 1-in. to 6-in. range.

(34) Use a heavy-duty boom around each berthing area to minimize the potential for an uncontained spill during offloading.

- o Effectiveness: Some PHC fractions may dissolve in the water before a spill can be removed. Spill impacts will be reduced with the use of the boom.

(35) Provide an OSCP, as well as local storage of spill cleanup equipment and availability of manpower, to help reduce the potential damage from spills in the marine environment.

- o Effectiveness: In the event of a pipeline or vessel spill, considerable long-term damage to the marine environment could occur.

(36) Require mitigation of marine resources and habitat impacts (see Appendix I.6).

- o Effectiveness: This measure will reduce the impacts on marine resources and habitat.

P. System Safety and Reliability

(37) Install block and check valves on the upstream and downstream side of all pump stations. Equip the pump stations with smoke detectors, fire sensors, and onsite firefighting equipment, in addition to an automatic station shutdown system and a local reset/lockout system. Provide emergency helicopter access to each station and prepare a written fire protection plan for each station. Ensure that on-call personnel residing near each station participate in firefighting training and fire drills. Ensure that maintenance vehicles carry two-way radios. Fence the pump stations and keep the land around station equipment and building clear of shrubbery and/or growth.

- o Effectiveness: This measure will effectively reduce the probability of explosion/fire at the pump station.

(38) Equip the pumps with seal leak detectors that would stop the pumps if excess seepage from the seal is detected. Inspect valve stem packing as part of the maintenance program.

- o Effectiveness: This measure will effectively reduce the probability of leakage at the pump station.

(39) Install sensor and control systems at the two tank farms to prevent tanks from overfilling. Install a foam extinguisher system on all floating roof tanks for tank seal fires. Provide Pactex personnel at each tank farm 24 hours/day, 365 days/year. Provide firefighting training for tank farm personnel. Equip the tank farms with appropriate smoke detectors, fire sensors, and onsite firefighting equipment. Provide a written fire protection plan for each tank farm in conjunction with local firefighting authorities.

- o Effectiveness: This measure will reduce the probability of fire/explosion at the tank farm and will reduce the consequences if either should occur.

(40) Equip each pump station and tank farm with a UPS to monitor equipment in case transmission lines are down or there is a power plant failure.

- o Effectiveness: This measure will prevent loss of the remote system monitoring caused by a loss of power.

(41) Design controls at pump stations and tank farms for unattended fail-safe operation in case of telephone or microwave system failure. Also, ensure that power outages will not reduce monitoring capabilities, further reducing the risk of a fire or explosion. Provide on-call pump station maintenance personnel from nearby locations. Provide 24-hour manning of tank farms.

- o Effectiveness: This measure will prevent system shutdown caused by a loss of communications.

(42) Require that a tank farm be placed as far away as possible from berthing facilities.

- o Effectiveness: This measure will reduce the potential for fire/explosion hazards at the tank farm and will reduce the potential for fires/explosions involving both the tank farm and berthing area.

Q. Oil Spill Potential

(43) Have the pipeline installed with a minimum 36-in. cover and a cathodic protection system. Install block and check valves at river crossings (also see measure 13). Hydrostatically test the pipeline, and X-ray a minimum of 10% of all welds. Continuously monitor the pipeline system for leaks at the control center. Provide aerial reconnaissance of the pipeline route as required by DOT. Develop and implement an OSCP.

- o Effectiveness: This measure will effectively reduce the probability of an oil spill from the pipeline and will reduce the consequences if one should occur.

(44) Install aboveground pipeline location markers. Maintain periodic contact with landowners. Bury the pipeline at an extra depth in areas where deep plowing or ripping could result in damage to the pipeline.

- o Effectiveness: This measure will increase the awareness of the pipeline location, thereby reducing the potential of damage to the pipeline from mechanical equipment.

(45) Design and construct the pipeline to accommodate geologic hazards, including a vibration monitoring system at known faults.

- o Effectiveness: Earthquake-resistant design is sufficiently advanced to make designs effective to survive most geohazards.

(46) Encase the pipeline in concrete at major stream crossings and bury it a minimum of 4 ft below the 100-year scour depth. Install a vibration monitoring system to indicate movement from abnormal bottom scouring.

- o Effectiveness: This measure will effectively reduce the probability of an oil spill.

(47) Have all tankers at berth in POLA boomed during offloading.

- o Effectiveness: This measure will limit the spread of any oil spill from tankers at berth.

(48) Surround oil storage tanks by oil containment dikes and collection systems. Equip tanks with redundant sensor and control systems to prevent tank overfilling.

- o Effectiveness: Sensors will reduce the probability of overflowing tanks. No spilled oil will be released beyond the diked containment.

4.7.2 AVAILABLE MITIGATION MEASURES

A. Air Quality

(49) Curtail transfer operations during first-stage or worse smog episodes.

- o Effectiveness: This measure would have no effect on annual emission levels but would provide a small decrease in precursor emissions on high oxidant days.

(50) Curtail construction activities during second-stage smog alerts.

- o Effectiveness: This measure would provide a small decrease in precursor emissions on high oxidant days.

B. Geologic and Seismic Setting

The following mitigation measures are recommended to minimize potential geologic and seismic hazards:

(51) Utilize existing information or conduct detailed geotechnical investigations along the pipeline route in areas with high potential for impacts. These studies will be used for development of design criteria.

- o Effectiveness: Detailed design requirements to offset potential impacts would be developed.

(52) Utilize existing or conduct detailed geologic investigations such as trenching in active fault zones as designated by the Alquist-Priolo Special Studies Act of 1972. This includes the Newport-Inglewood, Whittier, San Jacinto, and San Andreas fault zones.

- o Effectiveness: The identification of the specific historical rupture and creep as recorded in the Holocene sedimentation record would facilitate more effective design and site selection across the fault zone.

(53) Locate pump stations outside of the Alquist-Priolo Special Studies zones.

- o Effectiveness: Structural damage from ground rupture would be avoided. The potential for ground motion-induced damage to facilities would be reduced and would depend on the distance from the fault zone and local site conditions such as soils.

(54) Prior to project implementation, complete a detailed geotechnical evaluation of the potential for structural damage to the proposed landfill island by seismically induced landslides and liquefaction. The results of this investigation would be used to specify mitigation requirements for island design and construction. Specific measures might include berming on all four sides of the island (see Alternative Island Design 1), using mechanical compaction techniques, surcharging fill, pilings, or other means to reduce earthquake-induced damage.

- o Effectiveness: Structural design consideration to mitigate potential liquefaction on the landfill island would significantly reduce the potential for oil spills or other safety problems.

(55) Cover stockpiles of excavated materials or build sediment traps to mitigate erosion and sedimentation impacts, when necessary.

- o Effectiveness: Covering stockpiled materials would reduce air quality impacts and local erosional input. Sediment traps would reduce sedimentation by intercepting eroded materials.

(56) Use appropriate special engineering design methods in areas prone to specific geological hazards such as slope instability.

- o Effectiveness: Specific design considerations, depending on the depth of the slip surface, type of failure, etc., could effectively eliminate the potential hazard.

(57) Avoid areas of high landslide potential or take special engineering precautions to help prevent pipe failure if a landslide should occur.

- o Effectiveness: Avoidance, where feasible, has the fewest associated risks. Special engineering design can reduce pipe failure probabilities.

(58) Locate valves on each side of the San Andreas fault zone, and have the pipeline cross seismic faults at angles between 70 and 90 degrees where possible.

- o Effectiveness: This measure will reduce the potential for pipeline damage and potential spill volume at fault crossings.

(59) To minimize a potential oil spill after a major earthquake with its possible consequence of ground failure, design the section of pipeline in the area of high liquefaction potential near POLA and the areas that cross the active fault zones to resist rupture during the maximum horizontal and vertical displacements anticipated or construct it so that emergency repairs can be made quickly. Use automatic shutoff valves in the pipeline design.

- o Effectiveness: This measure would provide quicker access to the damaged pipeline, reducing the volume of oil spilled by allowing quicker containment, cleanup, and system repair.

(60) Because of the possibility of highly corrosive soils along the fault zones (subsection 4.2.3), recommend that soil corrosivity tests be made, especially within the Alquist-Priolo Special Studies zones. These tests would be used to design the corrosion-control systems adequately for these areas.

- o Effectiveness: This measure would help minimize the potential for pipeline rupture in a large earthquake.

C. Soils

No available measure. (See Measures 54 and 60 for geological mitigation measures that are soils related.)

D. Surface Water

(61) At stream crossings, minimize the disturbance of the streambed and banks. Keep to a minimum the area required for construction equipment. Control the drainage from the disturbed area with detention basins or straw bale filters. Divert the drainage from the undisturbed areas around the construction site.

- o Effectiveness: This measure will minimize the sediment loads to streams from adjacent disturbed areas.

(62) Use cofferdams or other construction techniques through the stream course to minimize the amount of suspended sediments resulting from trenching activities. Downstream detention basins, sedimentation traps, evaporation ponds, etc., should also be installed.

- o Effectiveness: Although a temporary increase in turbidity is unavoidable, this measure will keep sediment loads to a minimum.

(63) Use pipeline casing or drip pans at all aboveground crossings of waterways such as the Los Angeles River to divert oil spills to areas outside the channel.

- o Effectiveness: Assuming that the pipe casing or drip pan is not also damaged, this measure would effectively eliminate most spills into these streams (Los Angeles River and Rio Hondo).

(64) Conduct modeling to determine the scour depth of the 100-year, 24-hour runoff event for major stream crossings. Use this information to design the pipeline burial depth at least 4 ft below this depth. Check pipeline burial depth yearly at important stream crossings identified in this EIR/EIS. Where the stream channel has degraded to the point where the pipeline is exposed or is buried less than 4 ft below the 100-year scour depth, rebury the pipeline to the proper depth.

- o Effectiveness: This measure would reduce the probability of pipeline rupture caused by streambed transport to an acceptable risk.

(65) Install block and check valves where necessary to protect surface water resources at the following stream crossings: San Gabriel River, Santa Ana River, San Gorgonio River, Whitewater River, and Centennial Wash. These measures are in addition to those identified in the project description.

- o Effectiveness: This measure would reduce the potential volume of oil that could be spilled into these streams. This would provide an additional degree of protection to the surface water resource and would particularly protect the underlying groundwater aquifers.

E. Groundwater

(66) Conduct detailed hydrogeologic investigations where necessary for each municipal or domestic sensitive groundwater basin along the alignment (Tables 3.2.5-1 and -2). If available, use the investigations conducted for the All-American pipeline in areas where the two routes are coincidental. These investigations would include definition of groundwater depth, recharge sources, properties of overlying soils, hydraulic gradient, background water quality, and existing water uses. Inventory existing wells in an area extending hydrogeologically downgradient from the pipeline for 2 miles or for a distance downgradient in the aquifer equal to the distance that groundwater would move in 1 year.

- o Effectiveness: This information would be used to formulate an OSCP that would include plans for monitoring and early detection of groundwater contamination, notification of affected groundwater users and appropriate governmental agencies, site-specific cleanup and response, and identification of

emergency alternative water supplies. This is particularly important where the groundwater is used for municipal or domestic supplies.

F. Freshwater Biology

(67) Do not permit fueling and lubrication of construction equipment to occur within 0.25 mile of streams. No more than 2 barrels of fuel (about 84 gallons) should be kept at construction sites within 0.5 mile of sensitive streams. Equipment would be checked periodically for leakage to avoid spills. If a spill were to occur, report it to the Authorized Officer immediately.

- o Effectiveness: Refueling away from streams and performing periodic maintenance should reduce the risk of construction-related spills.

(68) Construct stream crossings at Wild Cat Canyon and Hot Springs Creek during early winter.

- o Effectiveness: Prohibiting construction during these months will avoid construction impacts to the Gila chub during the spawning and hatchling stages.

(69) Use double-walled pipe at stream crossings.

- o Effectiveness: The use of double-walled pipe will reduce the probability of oil spills into streams and riparian habitat.

(70) Locate staging areas for stream crossings outside the riparian zone. Minimize construction ROW in riparian zones.

- o Effectiveness: Restrictions on staging areas and width of ROWs in riparian zones will minimize the amount of sediment entering streams and will reduce the disturbance to riparian habitat.

(71) In addition to the block and check valves proposed by Pactex, use valves where necessary to protect important fish populations at the following stream crossings: San Gabriel, Santa Ana and San Pedro Rivers, and Bass Canyon and Wildcat Canyon Creeks.

- o Effectiveness: The use of block and check valves at stream crossings will substantially reduce the volume of oil entering aquatic and riparian habitat in the event of an oil spill.

G. Terrestrial Biology

(72) As determined by the authorized BLM officer, use native species to reseed in areas where research or previous projects indicate that reseeding may be effective. Consult with local BLM, extension, and SCS offices and universities to identify potential reseedable areas.

- o Effectiveness: Reseeding with native species will increase the rate of return to the predisturbance condition along the ROW. Revegetated sediments will restore wildlife habitat and reduce soil erosion.

(73) Avoid development disturbance to sensitive and valuable plant communities, including riparian areas, oak woodlands, live oaks, soapberry tree groves, and ironwood washes. Locations to be avoided will be determined by the landowner, land manager, or applicable regulatory agency. Reduce the construction ROW to 50 ft wide at riparian and desert wash crossings. Do not locate staging areas in sensitive communities. The landowner, land manager, or regulatory agency may reduce the construction ROW in specific locations to minimize impacts to other sensitive plant or wildlife communities.

- o Effectiveness: Avoiding and minimizing disturbance to sensitive areas and unique plant communities will minimize loss of vegetation and wildlife habitat by 50%.

(74) During construction in creosote scrub and alkali scrub areas of the desert, limit the ROW clearing to trimming or crushing whenever possible. Locate the new ROW, especially roads, immediately adjacent to existing disturbance.

- o Effectiveness: This measure will limit the amount of shrub vegetation disturbed and will reduce erosion. By not disturbing the root system, many crushed or clipped shrubs will resprout and revegetate the ROW more quickly, reducing soil erosion and speeding reestablishment of wildlife habitat.

(75) During construction in desert areas, pile some of the cleared or clipped vegetation in small thickets off the ROW (where acceptable to the landowner or land manager) to provide cover for displaced animals.

- o Effectiveness: Providing cover for displaced small mammals and reptiles, especially small desert tortoise, will decrease heat stress and minimize exposure to predators.

(76) Prohibit vehicle operation off the ROW by construction workers, except where specified by the landowner or land management agency.

- o Effectiveness: Limiting vehicle use off the ROW will minimize the risk of impacting livestock, wildlife habitat, small mammals, reptiles, and important or sensitive vegetation in surrounding habitats. This will be especially important in desert tortoise habitat, desert bighorn sheep range, and the Coachella Valley.

(77) During construction, limit the open pipeline trench to 0.5 mile in desert bighorn sheep areas or in areas where the pipeline could limit wildlife access to water such as Hot Springs Creek in Arizona. Use skip sections or temporary bridges across the pipeline trench if more than 0.5 mile of trench must remain open for an extended period.

- o Effectiveness: This measure will minimize impacts caused by water stress and disruption of movement patterns. Not all animals are accustomed to crossing skip sections; however, it will provide an opportunity for wildlife (e.g., deer and coyotes) accustomed to human presence to cross the pipeline trench.

(78) Construct pipeline across desert tortoise habitat between October and March when tortoises are hibernating. Require a desert tortoise expert to be present during construction. Remove any active desert tortoise from the construction ROW ahead of construction equipment and move to habitat within 100 yards of the capture site. Carefully open burrows within the ROW using hand tools, and remove hibernating tortoises. Remove tortoises unearthed by the trencher to an artificial burrow within 100 yards of the capture site. Give injured tortoises to the Department of Fish and Game. Provide adequate funds for costs involved in rehabilitating injured tortoises and returning them to their home sites (within 100 yards of capture site) by Pactex.

- o Effectiveness: Injuries and deaths of tortoises will be minimized if construction occurs when tortoises are inactive (i.e., only tortoises hibernating directly on the ROW would be impacted). Removal of active tortoises from the construction area will ensure survival of these individuals. Burrows can be successfully constructed with hand tools and plywood (BLM, 1984a, p. 4-156).

(79) Locate oil spill booms as near as possible to the manmade wetlands downstream of the Colorado River crossing. In the event of a spill, use these booms to prevent oil from entering backwater wetlands from the river or reaching Yuma clapper rail habitat 20 miles downstream.

- o Effectiveness: Booms have been used effectively for many years in containing oil and directing it to areas for cleanup. Locating booms near the crossing will minimize response time and will minimize the possibility of oil reaching sensitive habitats downstream (such as Cibola and Imperial NWRs and Yuma clapper rail habitat).

(80) Where the pipeline ROW follows existing ROWs, use the old ROWs as part of the construction ROW, and limit new disturbance to the area needed for trenching and stockpiling backfill.

- o Effectiveness: Using the existing ROW for construction will minimize the total area cleared, wildlife habitat lost, and area to be revegetated. Using the existing ROW will significantly minimize the total acres disturbed.

(81) At the Muleshoe Ranch Nature Preserve, do not permit construction to occur between April 1 and August 30. Revegetation will be in accordance with plans determined by the Nature Conservancy, BLM, and Forest Service. Use the existing El Paso ROW to the extent possible. Remove no large sycamore in Bass Canyon.

- o Effectiveness: Seasonal construction restrictions (i.e., no activity during the April to-August nesting season) will prevent nest abandonment by nesting raptors resulting from construction activity. Reseeding with native vegetation and minimizing impacts to riparian communities will decrease impacts on wildlife and wildlife habitat.

H. Socioeconomics

(82) Schedule the pipeline construction period so it does not coincide with peak tourist seasons. The areas affected by tourism include the Blythe, California area (April through September); Quartzsite, Arizona (November through April); and Guadalupe Mountains National Park/Pine Springs, Texas (June through September).

- o Effectiveness: This measure will minimize competition for temporary housing and camping sites between tourists and construction workers.

(83) Between Indio and Blythe, Blythe and Phoenix, and El Paso and Odessa, accommodate workers in areas where housing is available and provide transportation to and from the jobsite.

- o Effectiveness: This measure will centralize the impact on housing demand in areas that have sufficient resources to accommodate the construction work force.

(84) Provide temporary accommodations for construction workers at locations where housing is limited (eastern California, western Arizona, and western Texas).

- o Effectiveness: This measure will reduce conflicting demands for limited temporary housing among construction workers, tourists, and other travelers. The implementation of this measure, by providing housing in the proximity of the work site, would reduce the need for a large part of the work force to otherwise commute long distances, perhaps in excess of 100 miles round trip, to secure available housing.

(85) Have the Coast Guard redesignate anchorages in POLA eliminated by project implementation and possibly designate new anchorages to replace those eliminated.

- o Effectiveness: This measure would ensure a continuation of the same level, or allow for an increased level, of revenues for anchorage/bunkering activities.

I. Land Use and Recreation

(86) Use parallel existing utility and transportation ROW, whenever possible.

- o Effectiveness: This measure will minimize the adverse impacts on existing and future land uses traversed by the pipeline.

(87) On agricultural lands, use existing service roads for pipeline access whenever possible.

- o Effectiveness: This measure will minimize adverse impacts on existing and future land uses traversed by the pipeline.

(88) After construction has been completed, restrict motorized vehicle access to public lands crossed by the ROW.

- o Effectiveness: This measure will enhance revegetation efforts and will limit the proliferation of spur roads in sensitive resource areas.

(89) Minimize ROW clearing during construction when operationally feasible.

- o Effectiveness: This measure will minimize disruption of current land use and will reduce potential short-term impacts on future land use.

(90) Avoid placing pumping stations or maintenance sites in areas regarded as environmentally sensitive.

- o Effectiveness: Possible long-term impacts to special-use or environmentally sensitive areas will be reduced.

J. Transportation, Energy, Utilities, and Public Services

(91) Use precautions such as flashing lights, barriers, signing, and flagmen to warn motorists of the existence of construction equipment being transported or crossing roadways. Restrict construction equipment to the use of the pipeline ROW to the maximum extent possible.

- o Effectiveness: These measures will ensure greater highway safety, reduce vehicular traffic conflicts, and help maintain smoother highway traffic flows.

(92) Have the Coast Guard redesignate anchorages in POLA eliminated by project implementation and possibly designate new anchorages to replace those eliminated.

- o Effectiveness: This action will preclude possible ship groundings.

K. Cultural Resources

(93) The states have laws that require mitigation of impacts to cultural resources on state lands, but their requirements are not presently known. In California, CEQA allows various agencies to require consideration of cultural resources on private lands within their jurisdiction. There is no known equivalent to CEQA in Arizona, New Mexico, or Texas. Where required, the mitigation measures in subsection 4.7.1.K (above) could be implemented on all non-Federal lands.

- o Effectiveness: The available measures would avoid or alleviate adverse impacts on non-Federal lands.

L. Paleontology

(94) In addition to highly important Federal lands, the corridor would also cross about 280 miles (25% of corridor) of Federal land of moderate to low importance; approximately 240 miles (25% of corridor) of land under state, county, or local jurisdiction; and 495 miles (50%) of private land. The amount of ROW (in miles) in areas of high, moderate, and no mitigation effort is presented by jurisdication in Table 4.7.2-1 and by agency jurisdiction and state in Tables 4.7.2-2, -3, and -4.

(a) High Importance. The planned mitigation program described in subsection 4.7.1.L for highly important Federal land could be modified to meet all state and local agency requirements, if any, to mitigate the impacts to highly important paleontologic resources on non-Federal land. If implemented, this program would meet or exceed these requirements.

(b) Moderate Importance. Areas of moderate importance possibly containing common invertebrate remains and rarer highly important vertebrate remains that would be lost to construction activities and unauthorized collecting would be subject to a preconstruction field survey similar to that described for a high mitigation effort. However, this effort would be concentrated in the ROW, with only about 50% of the remaining moderately important area of the corridor being subject to a survey.

Construction monitoring would not be required in areas of moderate importance, unless important fossil remains were found during the survey or construction. If such remains were found, they would be evaluated and, if considered highly important, a comprehensive survey of the fossiliferous strata and construction monitoring in the immediate area of the site would be recommended as for areas originally designated as highly important.

Table 4.7.2-1 - Level of Available Mitigation Effort and Ownership for Total Pactex Corridor (mile)

Mitigation Effort	Owner and Length			
	Federal	Local Agency	Private	Total
High	0	20	46	66
Moderate	277	210	418	905
None	7	12	29	48
Total	284	242	493	1,019

Source: Lander, 1985.

Table 4.7.2-2 - Available High-Level Mitigation Effort: Section and Ownership for Pipeline Segments Along Pactex Corridor (mile)

Section	Owner and Length		
	Local Agency	Private	Total
California	5	20	30
Arizona	15	7	22
Southwestern New Mexico	0	0	0
West Texas	0	14	14
Southeastern New Mexico	0	0	0
West-Central Texas	0	0	0
Total	20	46	66

Source: Lander, 1985.

Table 4.7.2-3 - Available Moderate-Level Mitigation Effort: Section and Ownership for Pipeline Segments Along Pactex Corridor (mile)

Section	Owner and Length			
	Federal	Local Agency	Private	Total
California	70	35	114	219
Arizona	119	85	97	299
Southwestern New Mexico	49	40	63	152
West Texas	5	42	68	115
Southeastern New Mexico	36	8	12	56
West-Central Texas	0	0	64	64
Total	277	210	418	905

Source: Lander, 1985.

Table 4.7.2-4 - No Mitigation Effort: Section and Ownership for Pipeline Segments Along Pactex Corridor (mile)

Section	Owner and Length			
	Federal	Local Agency	Private	Total
California	0	0	0	0
Arizona	4	9	10	23
Southwestern New Mexico	3	3	1	7
West Texas	0	0	18	18
Southeastern New Mexico	0	0	0	0
West-Central Texas	0	0	0	0
Total	7	12	29	48

Source: Lander, 1985.

(c) Low Importance. Areas of low importance should not be surveyed or monitored, unless fossil remains are found during construction. If important fossils were uncovered during construction, mitigation measures similar to those for moderately important areas would be initiated in the immediate area of the site, the particular level of effort implemented being dependent on the importance of the remains.

(d) Postconstruction Effort. The planned postconstruction effort would be available for the suggested mitigation program.

- o Effectiveness: If the suggested program were implemented on Federal and non-Federal land, it would reduce the impacts to paleontologic resources on all lands where it would be in effect.

M. Visual Resources

(95) Place pumping stations and aboveground facilities to avoid areas with high visual quality.

(96) Where possible, locate pumping stations and aboveground facilities out of normal visibility range.

(97) Where possible, locate pumping stations and aboveground facilities near existing visual intrusions rather than in undistributed areas.

- o Effectiveness: Measures 95 through 97 will reduce the adverse impacts to the visual environment along the pipeline route.

(98) Screen or landscape pumping station and aboveground facilities when they are placed within a normal visibility range.

- o Effectiveness: The placement of screening and landscaping will reduce the intrusive character of the facilities, making the facilities aesthetically more pleasing.

(99) Remove aboveground structures after completion of operations.

- o Effectiveness: Removal of aboveground facilities will eliminate the permanent visual intrusion associated with construction and placement of such facilities.

N. Noise

(100) Prohibit operation of construction equipment before 7 a.m., after 5 p.m., or on weekends near sensitive areas (homes, schools, churches, hospital, etc.).

- o Effectiveness: This measurement will eliminate intrusive noise levels during the sensitive nighttime and weekend time periods.

(101) During construction, keep equipment as far away as possible from sensitive areas.

- o Effectiveness: This measure will reduce the impacts of increased noise levels associated with pipeline construction.

O. Oceanography and Marine Environment

(102) For channel and pipeline dredging, require the contractor to use dredge methods that minimize and localize the generation of turbidity and settleable solids. When possible, use a silt curtain to localize the plume.

- o Effectiveness: Use of a hydraulic cutterhead dredge and silt curtain will significantly reduce the spatial and temporal extent of the turbidity plume inside the harbor breakwater. The silt curtain will not be effective in sea conditions outside the breakwater.

(103) Require the contractor to use all practicable methods, such as inflatable baffles and temporary finger dikes, to maximize settling velocity and localize turbidity during island filling,

- o Effectiveness: This measure will reduce the spatial and temporal extent of the turbidity plume as the landfill approaches the water surface and the settling distance decreases.

P. System Safety and Reliability

(104) Require the use of the following tanker operation procedures:

(a) Have Pactex tariffs stipulate that all vessels use the vessel traffic information system (VTIS). (Vessels report to the Marine Exchange as they come out of the separation area and report where they are coming from and where they are going.)

(b) Equip each vessel with either a Doppler System or a shore system.

- o Effectiveness: This measure will decrease the potential of collisions or other tanker-involved accidents.

Q. Oil Spill Potential

No available measure.

4.8 UNAVOIDABLE ADVERSE IMPACTS

The construction and operation of the proposed Pactex landfill, pipeline, and associated structures would result in certain unavoidable significant adverse environmental impacts. The impacts during the construction phase would be, for the most part, short term and mitigative. Impacts associated with the operation phase of the project could be longer term.

Tables S-1 through S-4 in the Summary list all of the identified significant impacts resulting from the Pactex proposal and the component alternatives. Some impacts in those tables are still significant after applying planned mitigation measures from subsection 4.7.1. As explained in subsection 4.7, the planned mitigation measures are either required or included in the project description; available mitigation measures are not required unless they are adopted as permit stipulations by an authorizing agency.

Available mitigation measures are applied here in Tables 4.8-1 through -4 to impacts that are still significant in Tables S-1 to S-4. When the available mitigation measures are applied to the impacts that are still significant, unavoidable adverse impacts would result from the proposed project. Short-term unavoidable adverse impacts would occur during construction to soils, freshwater, terrestrial, noise, and oceanography and marine biology. Long-term unavoidable adverse impacts would occur during operation in all resource categories, except paleontology. Unavoidable adverse impacts with the component alternatives that differ from those with the proposed project would occur in terrestrial biology and groundwater (Table 4.8-2), marine biology and system safety (Table 4.8-3), and geology (Table 4.8-4).

Table 4.8-1 - Proposed Pactex Project: Unavoidable Adverse Impacts (see Table S-1)

Discipline	Significant Impact	Available Mitigation Measure (subsection 4.7)	Effectiveness	Unavoidable Adverse Impact
Geologic and Seismic Setting				
Operation	Potential landslide- and/or liquefaction-induced ground failure at the proposed landfill island in POLA	54	Minimize damage to terminal/facilities resulting from detailed geotechnical investigation of design requirements	Yes
	Potential ground rupture at fault crossings, including the Whittier-Elsinor, San Jacinto, and San Andreas faults	52, 53, 58, 59	Miminize potential for pipeline rupture and minimize oil volume that would be spilled in the event of a rupture	Yes
	Potential damage to pipeline resulting from slope failure and/or creep	56, 57	Reduce potential for landslide-induced damage to pipeline	No
Soils				
Construction				
	Erosion potential along route excluding Carlsbad Resource Area and private lands	NA[a]	NA	Yes
Operation	Impact of oil spills on sensitive soils on agricultural lands, including the Palo Verde, Gila River, and Rio Grande Valleys	NA	NA	Yes

Table 4.8-1 (Contd)

Discipline	Significant Impact	Available Mitigation Measure (subsection 4.7)	Effectiveness	Unavoidable Adverse Impact
Surface Water				
Operation	Major oil spills would degrade water quality below Federal and state standards	65	Minimize quantity of oil spilled and time for cleanup in event of pipeline rupture	Yes
Groundwater				
Operation	Potential oil spill contamination of sensitive groundwater basins (see Tables 3.2.5-1 and 3.2.5-2)	66	Use an OSCP for early detection, monitoring and spill cleanup to prevent contamination	Yes
Freshwater Biology				
Construction	Potential reduction in diversity and abundance of important fish species caused by fuel or lubricant spills in the Colorado River, Gila River, Hot Springs Canyon Creek, Bass Canyon Creek, Rio Grande, and Pecos River	67	Prevent spill events	No
	Loss of Colorado squawfish, humpback sucker or bonytail due to construction activities or alteration of habitat	NA	NA	Yes

Table 4.8-1 (Contd)

Discipline	Significant Impact	Available Mitigation Measure (subsection 4.7)	Effectiveness	Unavoidable Adverse Impact
Freshwater Biology (Contd)				
Construction (Contd)	Construction in streams of Muleshoe Nature Preserve may interfere with spawning and hatchling stages of Gila chub	68, 70	Seasonal restrictions and limits on staging area use will eliminate potential for impacts	No
Operation	Potential reduction in diversity and abundance of important fish species caused by major oil spills in the Colorado River, Gila River, Hot Springs Canyon Creek, Rio Grande, and the Pecos River	69, 71	Reduce risk of operation-related spills	Yes
Terrestrial Biology				
Construction	Loss of riparian habitat associated wildlife species	72, 73	Reduce amount of riparian disturbed	Yes
	Loss of ironwood washes and wash woodlands	72, 73	Minimize area of disturbance	Yes
	Loss of potential least Bell's vireo habitat in Whittier Narrows area	72, 73	Reduce loss of, or impact to, habitat	Yes

Table 4.8-1 (Contd)

Discipline	Significant Impact	Available Mitigation Measure (subsection 4.7)	Effectiveness	Unavoidable Adverse Impact
Terrestrial Biology (Contd)				
Construction (Contd)	Construction vehicle use of right-of-way (ROW) affecting sensitive wildlife and sensitive plants or communities	76	Minimize impacts on sensitive wildlife and sensitive plants or communities	No
	Loss of individual desert tortoise and their habitat	74, 75, 76, 78	Reduce impacts to individuals and habitat	Yes
	Loss of Coachella Valley fringe-toed lizards and other sensitive wildlife species associated with the blowsand ecosystem	74, 75, 76, 80	Reduce impacts to individuals and habitat	Yes
Operation	Impacts of an oil spill on Colorado River affecting wetlands, waterfowl, and Yuma clapper rail (Federally listed - endangered)	69, 79	Reduce risk and potential impacts of an oil spill	Yes
	Loss of sensitive wildlife habitat in the Muleshoe Nature Preserve	69, 71	Reduce loss of, or impacts to, sensitive habitat	Yes
	Loss of potential least Bell's Vireo habitat at Whittier Narrows and proposed critical habitat along the Santa Ana River due to an oil spill	69, 71	Reduce loss of, or impacts to, potential and proposed critical habitat	Yes

Table 4.8-1 (Contd)

Discipline	Significant Impact	Available Mitigation Measure (subsection 4.7)	Effectiveness	Unavoidable Adverse Impact
Land Use and Recreation				
Operation	Disruption of recreational activities in POLA area in the event of a major oil spill from the pipeline or tanker	NA	NA	Yes
Paleontology				
Construction	Potential loss of fossils in moderately important areas on Federal land and highly and moderately important areas on local agency and private land by construction and unauthorized collection of fossils	94	Reduce or avoid adverse direct and indirect impacts to paleontologic resources	No
Operation	Increased potential for unauthorized collecting of fossils in moderately important areas on Federal land and highly/ moderately important areas on local agency and private land	94	Reduce adverse indirect impacts to paleontologic resources	No
Noise				
Construction	Temporary exceedance of ambient levels at residences, schools, and parks along the pipeline ROW	100, 101	Reduce disturbance potential of project activities	Yes

Table 4.8-1 (Contd)

Discipline	Significant Impact	Available Mitigation Measure (subsection 4.7)	Effectiveness	Unavoidable Adverse Impact
Oceanography and Marine Biology				
Construction	Loss of 208 acres of deep soft bottom habitat from fill and dike before consideration of marine habitat gained from other island components	NA	NA	Yes (see Appendix I.6)
Operation	Decreased utility of feeding habitat and significant impacts on least tern breeding success if any oil spill reaches foraging habitat around the time of, or during, the April-to-September breeding season	NA	NA	Yes
	Long-term impacts to marine biology from an oil spill event in the harbor	NA	NA	Yes
System Safety and Reliability				
Operation	Potential for fire, explosion, and system shutdown	NA	NA	Yes
	Tanker collisons/accidents	104	Reduce potential for tanker collisions and other accidents	Yes

Table 4.8-1 (Contd)

Discipline	Significant Impact	Available Mitigation Measure (subsection 4.7)	Effectiveness	Unavoidable Adverse Impact
Oil Spill Potential				
Operation	Oil spill probabilities would vary, based on volume of oil lost and the age of pipeline. Probability of 0.03 spill/year of 50 barrels or greater for a new pipeline. Probability would increase to 0.93 spill/year after 30 years of operation. Probability of 7 spills/100 barrels or more at POLA tank farm and 11 spills/100 barrels or more at Midland tank farm over 30-year period.	NA	NA	Yes

[a]NA = None applicable/not applicable.
Source: ES, 1985.

Table 4.8-2 - Coachella Valley Alternative: Unavoidable Adverse Impacts (see Table S-2)

Discipline	Significant Impact	Mitigation Measure (subsection 4.7)	Effectiveness	Unavoidable Adverse Impact
Terrestrial Biology				
Construction	Loss of Coachella Valley fringe-toed lizards and other sensitive wildlife species associated with the blowsand escosystem	74, 75, 76, 80	Reduce numbers lost or injured and amount of habitat disturbed	Yes
Paleontology				
Construction	Potential loss of fossils by construction and unauthorized collection in areas of moderately important exposure; 5 fewer fossil localities and 3 fewer miles of highly important fossiliferous exposure impacted than in Pactex proposal	94	Reduce adverse direct impacts to paleontologic resources	No
Operation	Increased potential for unauthorized collecting in fossiliferous areas; 5 fewer fossil localities and 3 fewer miles of highly important fossiliferous exposure impacted than in Pactex proposal	94	Reduce adverse indirect impacts to paleontologic resources	No

Source: ES, 1985.

Table 4.8-3 - Landfill Alternative 1: Unavoidable Adverse Impacts (see Table S-3)

Discipline	Significant Impact	Mitigation Measure (subsection 4.7)	Effectiveness	Unavoidable Adverse Impact
Paleontology				
Construction	Potential loss of moderately important strata by dredging and filling; 25 fewer acres impacted by filling than in the proposed landfill	94	Reduce adverse direct impacts to paleontologic resources	No
Oceanography and Marine Biology				
Construction	Loss of 183 acres of deep soft bottom habitat from fill and dike (net difference of 25 acres) before consideration of marine habitat gained from other island components	NA	NA	Yes (see Appendix I.6)
System Safety and Reliability				
	Reduced setback of tanks from berths	NA	NA	Yes

Source: ES, 1985.

Table 4.8-4 - Landfill Alternative 2: Unavoidable Adverse Impacts (see Table S-4)

Discipline	Significant Impact	Available Mitigation Measure (subsection 4.7)	Effectiveness	Unavoidable Adverse Impact
Geologic and Seismic Setting				
Operation	Reduced risk of landslide and/or liquefaction-induced ground failure of fully contained landfill island in POLA	54	Reduce potential for landslide and/or liquefaction-induced ground failure	Yes
Paleontology				
Construction	Potential loss of moderately important strata by dredging and filling	94	Reduce adverse direct impacts to paleontologic resources	No

Source: ES, 1985.

4.9 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The environment in the vicinity of the Pactex pipeline and associated structures would be affected for the short period of time necessary to construct the proposed pipeline system. These effects include elevated noise levels, air emissions, removal of minor amounts of wildlife habitat and vegetation, increased turbidity in freshwater and marine systems, and minor disruption of local traffic patterns. The lengths of time for which these impacts would persist at a given point along the route range from a few weeks, in the case of noise impacts, to decades for natural revegetation of arid areas. Small oil spills and ensuing cleanup activities would also have short-term effects on the environment.

Construction, routine operation, and abandonment of the proposed pipeline would have minimal long-term effect on the environment. However, a major accidental release of oil and contamination of groundwater supplies could have significant and long-term effects. Oil in groundwater does not degrade naturally and may ultimately be dispersed over long distances, impairing water quality and reducing groundwater supplies as a result of decreased permeability of the aquifer. A major oil spill in POLA could also have long-term effects. Impacts to intertidal and benthic organisms could be long term, and concentration of hydrocarbons in the food chain could retain the effects of oil contamination in the environment for a long period of time. A major oil spill would also adversely impact recreational uses of Los Angeles Harbor. The pipeline system would contribute to long-term economic productivity of the United States by transporting crude oil from oil-rich portions of the country to areas of the country with surplus oil refining capacity. Pactex maintains that the reason the project is justified now is that a delay of the project would impose a risk to its economic feasibility and would delay the revenue and employment benefits. Pactex also maintains that a delay for an indefinite time period of the Pactex pipeline project would result in the following negative impacts:

(1) Loss of savings on transportation cost of crude oil for the nation.

(2) Increased possibility of the occurrence of an energy crisis caused by a lack of reliable transport through foreign waters.

(3) Increased possibility of construction of the project during an inflationary period, resulting in rising construction costs that may affect the feasibility of the project.

Pactex maintains that the positive results from the implementation of the project in the winter of 1985-1986 are:

(1) Provide significant employment in construction and equipment manufacturing.

(2) Increased tax revenues to the four states the pipeline traverses.

(3) Insurance that midwestern and eastern refineries will continue to receive crude oil to process for market demand.

4.10 IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES

Construction and operation of the proposed Pactex pipeline project and all alternatives could result in either the irreversible or irretrievable commitment of certain resources. An irreversible commitment of a resource is one that cannot be changed once it occurs. An irretrievable commitment means that the resource cannot be recovered or reused. Irreversible and irretrievable impacts are summarized in Table 4.10-1. With the application of the planned mitigation measures (subsection 4.7.1), no resource will be overcommitted by the construction or operation of the proposed Pactex pipeline.

Table 4.10-1 - Commitment of Resources Resulting from the Pactex Proposal or Component Alternatives

Resource	Irreversible	Irretrievable	Comment
Air quality	no	no	No significant long-term commitment of resources.
Geologic and seismic setting	no	yes	The construction of the Pactex landfill island would require approximately 2.9 million tons of rock, ranging from 2.5 million tons of quarry run to 0.19 million tons of 5-ton armor rock. This would be considered an irretrievable commitment of resources.
Soils	no	no	No significant long-term commitment of resources.
Surface water	no	no	No significant long-term commitment of resources.
Groundwater	no	no	No significant long-term commitment of resources.
Freshwater biology	no	no	No significant long-term commitment of resources.
Terrestrial biology	no	yes	The losses of live oak trees and desert tortoises would be irretrievable. Oak woodlands and desert scrubland would not regenerate within the life of the project (30 years). Riparian habitat might not recover to

Table 4.10-1 (Contd)

Resource	Irreversible	Irretrievable	Comment
Terrestrial biology (Contd)			former state. These could be considered long-term commitments of resources.
Socioeconomics	no	no	No significant long-term commitment of resources.
Land use and recreation	yes	yes	Commitment of 276 acres of land for pump stations and terminal storage facilities.
Transportation, energy, utilities, and public services	no	no	No significant long-term commitment of resources.
Energy	yes	yes	Construction and operation of the project would irreversibly and irretrievably commit energy sources.
Cultural resources	no	no	No significant long-term commitment of resources.
Paleontology	yes	yes	There would be an irreversible and irretrievable commitment of fossils, fossil localities, and fossil-bearing or potentially fossil-bearing rocks on moderately important Federal land, as well as highly and moderately important non-Federal land.
Visual resources	no	yes	Construction of the proposed landfill is an irretrievable commitment of visual resources in POLA.
Noise	no	no	No significant long-term commitment of resources.
Oceanography and Marine biology	yes	yes	Soft bottom POLA habitat would be irretrievably lost under landfill island, but rocky shoreline habitat would be created. Water column habitat would be lost.

Table 4.10-1 (Contd)

Resource	Irreversible	Irretrievable	Comment
Oil spill	yes	yes	In the event of a major oil spill, an irreversible and/or irretrievable commitment of resources could occur for the following resources: soils, surface water, groundwater, freshwater biology, terrestrial biology, land use and recreation, visual resources, and marine biology.

Source: ES, 1985.

4.11 GROWTH-INDUCING IMPACTS OF THE PROJECT

Because of the character of the Pactex pipeline project, the size of the work force, and the short-term duration of project construction, no significant growth-inducing impacts are foreseen. Adequate housing and public facilities/services are currently available to accommodate the construction and operations work forces along most of the pipeline route. Temporary impacts would not be significant enough to require major capital improvements, which might induce growth in an area. Furthermore, the largest capital expenditures, such as those associated with construction of the berthing/transfer facility at POLA will occur in an area with an immense economic base that readily absorbs the local economic impact of the Pactex project without any discernible effect. A large portion of the permanent pipeline-related employment will also be located in the Los Angeles area.

The Pactex pipeline would allow the transportation of crude oil to gulf coast refineries; however, this is not expected to induce the growth of these refineries because this crude is already being transported to these refineries by tanker. The existing oversupply of refining capacity in the gulf states indicates that discernible growth-inducing impacts are not anticipated at this time.

SECTION 5
CONSULTATION AND COORDINATION

SECTION 5

CONSULTATION AND COORDINATION

5.1 INTRODUCTION

To initiate the environmental review process, Pactex filed applications with the BLM and the LAHD. The BLM and LAHD (joint lead agencies) requested and received the consultation of many organizations and individuals, both public and private, in developing and coordinating the draft EIR/EIS on a proposal to transport crude oil from POLA to Midland, Texas.

5.2 ENVIRONMENTAL REVIEW PROCESS

The BLM California Desert District was determined to be the Federal lead agency responsible for the preparation of the EIS under the National Environmental Policy Act (NEPA). LAHD was determined to be the state lead agency responsible for preparation of the EIR under the California Environmental Quality Act (CEQA).

The first step in the Federal EIS process is to publish a Notice of Intent (NOI) for the preparation of an EIS in the Federal Register. The NOI for Pactex was published by the BLM on January 10, 1985. The first step in the California EIR process is the preparation of an initial study (see Appendix C) and distribution of a notice of preparation. LAHD circulated an NOP to all affected state and local agencies along the proposed pipeline route in California on January 18, 1985. These agencies identified for the BLM and LAHD those areas of concern that should be considered as part of the project review and included in the EIR/EIS, as appropriate.

The second step in the NEPA/CEQA process, termed "scoping," determines the significant issues and concerns relating to a proposed action that should be included in the draft EIR/EIS. Public meetings were held to identify major issues and concerns. During January and February 1985, eight scoping meetings were held in cities in the general vicinity of the proposed pipeline route:

Location	Date
POLA, San Pedro, California	January 28, 1985
Carson Community Center, Carson, California	January 28, 1985
Raincross Square, Riverside, California	January 31, 1985
Pima County Board of Supervisors Auditorium, Tucson, Arizona	February 4, 1985

Location	Date
Maricopa County Board of Supervisors Auditorium Phoenix, Arizona	February 5, 1985
City Council Chambers, El Paso City Hall El Paso, Texas	February 7, 1985
Carlsbad Public Library, Carlsbad, New Mexico	February 7, 1985
City Council Chambers, Midland City Hall Midland, Texas	February 8, 1985

Following a description of the project, participants were asked to suggest issues to be considered in the EIR/EIS. Issues were listed on a flip chart. At the end of the meeting, each participant was asked to rank the issues in order of their importance to that individual. Following the meeting, issues were scored based on their ranking. Only the top five rated issues were ranked; the top-rated issue received 9 points; the second, 7 points; the third, 5 points; the fourth, 4 points; and the fifth, 3 points (see Table 5-1 for final ratings). A detailed summary was published by BLM and is available at the California Desert District office in Riverside and LAHD.

Issues identified at the scoping meetings and in the responses to the NOP, and additional concerns of the cooperating agencies, are discussed in this EIR/EIS.

The draft EIR/EIS has been issued to Federal, state, and local agencies, as well as the general public for review; it has also been made available to local libraries for public review. The public review period is 45 days during which time five public hearings will be held in the four states. Agency and public comments will then be incorporated and a final EIR/EIS published. The final EIR/EIS will then be filed with EPA by BLM and certified as complete by LAHD.

5.3 CONTRACTS WITH OUTSIDE CONSULTING FIRMS

A consulting contract was executed with Engineering-Science, Inc. (ES) of Arcadia, California, to conduct investigations, collect data, prepare analyses, and provide informational input to the EIR/EIS. The purpose of the EIR/EIS is to provide decisionmakers and the public with a comprehensive and objective analysis of the environmental impacts of the proposed project in a document that is clearly written and that complies with both NEPA and CEQA. The ES subcontractors include Greenwood & Associates of Pacific Palisades, California, and Dr. E. Bruce Lander of Tujunga, California (see Table 5-2).

5.4 OTHER AGENCY PARTICIPATION IN PREPARATION OF THE DRAFT EIR/EIS

The U.S. FWS, Laguna Niguel, and the COE, Los Angeles District, having jurisdiction by law and special expertise relating to the project, were determined to be cooperating agencies (40 CFR 1501.6). Liaison was maintained with the California Secretary of Environmental Affairs office. The role of a

Table 5-1 - Summary of Issues and Concerns Raised During Scoping

Category	Ranking by Issue Category	Details
Air Quality	202	Emission Control Systems Oil Tank Emissions Innovative Emission Controls Proposed Offsets (L.A.) General
System Safety	160	Earthquakes General Safety of Storage Tanks River Crossings (oil spill)
Employment	141	Employment
Economic Feasibility	105	Project Feasibility Relationship to OCS Production Size and Life Economics of Supply
L.A. Harbor Operations	97	Single-Point Buoys Weather and Wind (harbor) Alternative Offloading Locations and Methods
National Security	89	National Security
Restoration and Rehabilitation	84	Restoration and Rehabilitation
Others	50	-

Source: BLM, 1985.

Table 5-2 - List of Preparers for the Pactex Pipeline Project

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
Port of Los Angeles		
Vern Hall Project Manager	B.S., Engineering, University of California, Los Angeles; 27 years of professional experience.	California Project Manager.
Lillian Kawasaki Assistant Environmental Scientist II	M.S., Biology, California State University, Los Angeles; B.S., Zoology, California State University, Los Angeles; 11 years of professional experience.	State Environmental Project Coordinator.
Frank Edmands II Assistant Environmental Scientist II	M.A., Biology, California State University, Fullerton; B.A., Biology, California State University, Fullerton; 9 years of professional experience.	Technical assistance and review.
Paul Johansen Assistant Environmental Scientist II	B.S., Marine Biology, California State University, Long Beach; M.S., in progress, California State University, Long Beach; 5 years of professional experience.	Technical assistance and review.
Michael Martin Assistant Environmental Scientist II	M.A., Biology, California State University, Long Beach; B.S., Marine Biology, California State University, Long Beach; 14 years of professional experience.	Technical assistance and review.
Donald Rice Assistant Environmental Scientist III	M.S., Biology, California State University, Long Beach; B.S., Biology, California State University, Long Beach; 10 years of professional experience.	Technical assistance and review.
Delaine Winkler Assistant Environmental Scientist II	M.S., Biology, University of Southern California; B.S., Biology, University of Southern California; 6 years of professional experience.	Technical assistance and review.
Bureau of Land Management		
William Haigh Chief, Planning & Environmental Staff California Desert District, BLM	B.S., Geography, University of California, Los Angeles; 10 years of professional experience.	Federal Project Manager; Quality Review, Planning, Agency Liaison, and Joint Revie Panel.

Table 5-2 (Contd)

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
Carol Rector	Ph.D. Candidate, Anthropology, University of California, Riverside; 10 years of cultural resources management work; M.A. equivalent, Anthropology, University of California, Riverside; B.A., Anthropology, University of California, Riverside.	Cultural resources quality review; agency liaison.
Larry Foreman	Ph.D., Wildlife and Fisheries Sciences, Texas A&M University; M.S., Systems Engineering, West Coast University; M.S., Wildlife Management, Humboldt State University; B.S., Mathematics, University of California, Los Angeles; 6 years of wildlife management work.	Terrestrial biology quality review; agency liaison.
California State Secretary of Environmental Affairs		
Wes Ervin Coastal Project Coordinator for Office of Offshore Development	B.S., Anthropology, University of California, Riverside; Certificate in Business Management, University of California, Los Angeles; 10 years of professional experience.	CEQA Process Facilitation and Permit Assistance, Joint Review Panel.
U.S. Army Corps of Engineers		
Nancy Farrell	M.S., in progress, Anthropology-Archaeology, University of California, Los Angeles; B.A., Anthropology, University of California, Los Angeles; 16 years professional experience.	Environmental Coordinator for COE.
Cliff Rader	M.A., Environmental Planning, University of California, Los Angeles; B.A., Geography, University of California, Los Angeles; 5 years professional experience.	Review of COE regulatory issues.
Harvey Beverly	9 years professional experience	Review of COE regulatory issues.

Table 5-2 (Contd)

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
Engineering-Science, Inc.		
Paul Smokler Project Manager	Dr. Environmental Science and Engineering, University of California, Los Angeles; M.P.H., Environmental Management, UCLA; B.A., Zoology, UCLA; 12 years of professional experience.	EIR/EIS Manager: project management, coordination, planning, quality control, and agency liaison.
John Hopkins Assistant Project Manager/ Task Manager	Dr. Environmental Science and Engineering, University of California, Los Angeles; M.S., Chemical Engineering, University of Detroit; B.S., Chemical Engineering, University of Detroit; 15 years of professional experience.	EIR/EIS preparation: quality review, oil spills, health and safety, construction, earth sciences, air quality, and noise.
Tom Corrigan Task Manager	M.B.A., Transportation, American University; B.A., Economics, University of Kansas; 26 years of professional experience.	EIR/EIS preparation: socioeconomics transportation, recreation and land-use planning, visual impacts, cultural resources, and paleontology.
Lou McNairy Task Manager	M.S., Fisheries, Humboldt State University; B.S., Zoology, Brigham Young University; 14 years of professional experience.	EIR/EIS preparation: quality review, marine, freshwater, and terrestrial biology.
Bob Bryan Technical Specialist	B.E., Chemical Engineering, University of Southern California; 36 years of professional experience.	Air resources.
Richard Burke Technical Specialist	M.S., Technology and Human Affairs, Washington University; B.S., Acoustics, Stanford University; 11 years of professional experience.	Noise.
Diane Concannon Technical Specialist	M.S., Natural Resources - Range and Wildlife Management, Humboldt State University; B.A., Biology, Humboldt State University; 6 years of professional experience.	Terrestrial biology, aquatic biology, wilderness, and biological assessment.
John Engel Technical Specialist	M.S., Environmental Engineering, Ohio State University; B.S., Biology, University of Notre Dame; 7 years of professional experience.	Groundwater, surface water, geology, and soils.

Table 5-2 (Contd)

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
Jim Goepel	B.A., Atmospheric Sciences, University of California, Los Angeles; 8 years of professional experience.	Air resources.
Scott Hedges Technical Specialist	B.S., Civil Engineering, Purdue University; M.S. Candidate, Environmental and Occupational Health, California State University, Northridge; 7 years of professional experience.	Air quality.
Judith Herman Technical Editor	B.A., English, University of California, Los Angeles; 22 years of professional experience.	Technical editing and coordination of EIR/EIS.
Richard Makdisi Technical Specialist	M.S., Geology, California State University, Hayward; B.A., Geology, University of London; B.S., Geology, California State University, Hayward; 7 years of professional experience.	Geology and soils.
Michael Melanson Technical Specialist	M.S., Ecology, University of San Francisco; M.S. Candidate, Environmental Planning and Management, University of San Francisco, Continuing Education; B.S., Biology, University of San Francisco; 11 years of professional experience.	Oil spill contingency and system safety.
Phil Morris Technical Specialist	M.B.A., Pepperdine University; B.S., Civil Engineering, Iowa State University; 25 years of professional experience.	Technical Director: EIR/EIS review and quality assurance.
David Moss Technical Specialist	M.A., Marine Policy, College of Marine Studies, Delaware; Dr. Environmental Science and Engineering Candidate, University of California, Los Angeles; B.A., Biological Sciences, University of Delaware; 5 years of professional experience.	Project management, coordination, quality review, marine biology, marine environment, physical oceanography, cumulative impacts, unavoidable adverse impacts, alternatives.

Table 5-2 (Contd)

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
Tom Peters Technical Specialist	M.B.A., California State University, Dominguez Hills; B.S., Meteorology, California State University, San Jose; 12 years of professional experience.	Air resources.
Jim Roberts Technical Specialist	Ph.D., Geography, University of California, Los Angeles; M.A., Geography, University of California, Los Angeles; A.B., Geography, Stanford University; 29 years of professional experience.	Technical advisor; EIR/EIS review.
Laura Simonek Technical Specialist/ Project Coordinator	B.A., Analysis and Conservation of Ecosystems, University of California, Los Angeles; 1 year of professional experience.	Land-use and recreation, visual resources, project coordination.
Penny Sisson Technical Specialist	B.S., Zoology, California State Polytechnic University, Pomona; 5 years of professional experience.	Coordination of EIR/EIS sections.
John Simms Technical Specialist	B.S., Environmental Engineering Candidate, University of California, Northridge; 1 year of professional experience.	Noise.
Phil Storrs Technical Specialist	M.E., Civil and Sanitary Engineering, University of California, Berkeley; B.S., Civil and Sanitary Engineering, University of California, Berkeley; 32 years of professional experience.	Technical advisor; EIR/EIS review.
Tom Williams Technical Specialist	Ph.D., Paleontology, University of California, Berkeley; M.A., Zoology, University of Kansas; B.A., Geology and Zoology, University of Kansas; 22 years of professional experience.	Cultural resources and paleontology.
<u>Greenwood & Associates</u>		
Roberta Greenwood	A.B., Wellesley College; 36 years of professional experience.	Cultural resources.

Table 5-2 (Contd)

Name/Affiliation	Education/Experience	EIR/EIS Responsibility
John Foster	B.A., Anthropology, California State University, Northridge; 7 years of professional experience.	Cultural resources.
Bruce Lander		
Bruce Lander	Ph.D., Paleontology, University of California, Berkeley; M.A., Paleontology, University of California, Berkeley; B.A., Geology, University of California, Los Angeles; 20 years of professional experience.	Paleontology.
Cultural Resources Management Division New Mexico State University		
Frederick Plog	Ph.D., University of Chicago; M.A., Economics, University of Chicago; B.A., Northwestern University; 17 years of professional experience.	Cultural resources.

cooperating agency is to cooperate with and assist the lead agency in preparation of the document. Liaison was maintained with other Federal, state, and local agencies, organizations, and individuals concerning specific areas of expertise (see subsections 5.6 to 5.8).

5.5 ARCHAEOLOGICAL COORDINATION

Contacts and Memoranda of Agreement would be established with State Historic Preservation Officers (SHPOs) in the four states along the pipeline route and the Advisory Council on Historic Preservation before construction begins.

5.6 NOP AND DRAFT EIR/EIS MAILING LIST

Copies of the draft EIR/EIS were mailed to the agencies and organizations listed below. Asterisks (*) indicate those that received the NOP. Copies of the draft EIR/EIS were also sent to members of Congress and state legislators.

(1) Federal Agencies

Advisory Council on Historic Preservation*
Department of Agriculture
- Forest Service (Coronado National Forest)
- Soil Conservation Service (Arizona, California, and New Mexico)

Department of the Army
- Corps of Engineers (Los Angeles District, Albuquerque District)*
- Fort Bliss Military Base

Department of the Navy*
Department of Commerce
- National Oceanographic and Atmospheric Administration
- National Marine Fisheries Service*

Department of Energy
Department of Housing and Urban Development
Department of the Interior
- Bureau of Indian Affairs
- Bureau of Land Management (California Desert District; Indio Resource Area; Arizona, California, New Mexico State Offices)
- Bureau of Mines
- Bureau of Reclamation (Lower Colorado Region Office)
- Fish and Wildlife Service (Laguna Niguel Field Office*; Region 2HQ, Albuquerque)
- Geological Survey
- Minerals Management Service (Pacific OCS Region)*
- National Park Service (Southwest Region)
- Office of Environmental Project Review

Department of Transportation
- Eleventh Coast Guard District*
- Federal Aviation Administration
- Federal Highway Administration
- Federal Maritime Administration*
- Federal Maritime Commission*
- Federal Railroad Administration
- Research and Special Programs Administrations

Environmental Protection Agency*
Federal Energy Regulatory Commission
International Boundary and Water Commission
Interstate Commerce Commission
U.S. Customs Service*
U.S. Government Printing Office

(2) State Agencies

Arizona

Air Quality Control Board
Bureau of Mines
Commission of Agriculture and Horticulture
Corporation Commission
Department of Health Services
Department of Parks and Recreation
Department of Revenue
Department of Transportation
Environmental Planning Commission
Game and Fish
Governor's Commission on Arizona Environment
Indian Affairs Commission
National Guard
Natural Resource Department
Office of Economic Planning and Development
Office of the Governor
State Attorney's Office
State Contractor's Office
State Engineer's Office
State Historic Preservation Office
State Lands Department
Water Quality Control Board

California

Air Resources Board*
Bureau of Indian Affairs*
California Department of Transportation*
Coastal Commission*
California Division of Mines and Geology
Department of Boating and Waterways
Department of Conservation*
Department of Fish and Game*
Department of Forestry*
Department of Health Services*
Department of Industrial Relations*
Department of Parks and Recreation*
Department of Water Resources
Energy Commission*
Native American Heritage Commission
Office of Planning and Research*
Public Utilities Commission*

Regional Water Quality Control Boards*
Resources Agency
Secretary of Environmental Affairs*
State Board of Equalization
State Division of Oil and Gas*
State Lands Commission*
State Historic Preservation Office*
State Water Resources Control Board*
Southern California Air Pollution Control Board

New Mexico

Bureau of Mines and Mineral Resources
Commissioner of Public Lands
Corporation Commission
Department of Agriculture
Department of Finance and Administration
Department of Game and Fish
Energy and Minerals Department
Environmental Improvement Division
Governor's Budget and Planning Office
Health and Environment Department
Highway Department
Natural Resources Department
Office of the Governor
Oil Conservation Commission
State Historic Preservation Office
State Land Office
State Parks and Recreation Commission
State Planning Office

Texas

Air Control Board
Commissions Court for the counties of Culberson, Ector, El Paso, Hudspeth, Loving, Midland, Reeves, and Winkler
Department of Health
Department of Highways and Public Transportation
General Lands Office
Office of the Governor
Parks and Wildlife Department
Railroad Commission of Texas
State Historic Preservation Office

(3) Tribal Governments

Arizona

AkChin Indian Council
Colorado River Indian Tribes
Fort Yuma River (Quechan Indian Nation)
Gila River Indian Community
Papago Agency
San Carlos Apache Tribe
The Salt River Pinal-Maricopa Indian Community

California

Agua Caliente Indian Reservation
Morongo Indian Reservation
Fort Mojave Indian Reservation
Chemehuvui Indian Reservation

Texas

Tigua Indian Reservation

(4) Local Agencies

Arizona

Arizona Association of Conservation Districts
Arizona Association of Counties
Central Arizona Association of Governments
City Managers for Casa Grande, Coolidge, Hayden, Phoenix, Tucson, and Willcox
County Boards of Supervisors (for all counties)
Cochise County Board of Commissioners and Department of Planning and Development
District 4 Council of Governments
Gila County Board of Supervisors
La Paz County Board of Commissioners
La Paz County Planning and Zoning Director
Maricopa Association of Governments
Maricopa County Department of Planning and Development
Pima County Board of Commissioners and Department Planning and Development
Pinal County Board of Commissioners and Department of Planning and Development
Southeast Arizona Governments Organization

California

Air Pollution Control Districts*
South Coast Air Quality Management District
Los Angeles County Department of Health Services
Boards of Supervisors for the Counties of Los Angeles, Riverside, and San Bernardino
Southern California Association of Governments*
Los Angeles County Flood Control and County Road Districts*
Riverside County Flood Commission*
San Bernardino County Flood Control and County Road Districts*

Cities

Banning*	Coachella*	Indian Wells	Montebello*	Pomona*
Beaumont*	Colton*	Indio*	Ontario	Rancho Mirage
Blythe*	Compton*	Industry*	Palm Desert	Redlands*
Carson*	Desert Hot Springs	Loma Linda*	Palm Springs	Rialto*
Cathedral City	Downey*	Long Beach*	Paramount*	San Bernardino
Chino*	Fontana*	+Los Angeles*	Pico Rivera*	South Gate*

Planning Departments (for affected counties)*
Port of Long Beach*
+The list of departments that received the NOP is available from Mr. Calvin Hurst, POLA.

New Mexico

City Managers for Anthony, Deming, and Lordsburg
County Commissioners for counties of Dona Ana, Eddy, Grant, Hidalgo, Lea, and Luna
County Planning Departments for counties of Dona Ana, Eddy, Grant, Hidalgo, Lea, and Luna

Southern Rio Grande Council of Governments
Southwest New Mexico Council of Governments
Southwest New Mexico Resource Conservation District

Texas

City Managers for El Paso and Midland
City-County Building, El Paso
County Courthouses for counties of Ector, Hudspeth, Midland, Upton, Ward and Winkler
El Paso County Commissioners
Permian Basin Regional Planning Commission
West Texas Council of Governments

(5) Nongovernment Organizations

American Mining Congress
American Wilderness Alliance
Arizona Cattle Growers Association
Arizona Conservation Council
Arizona Desert Bighorn Sheep Society
Arizona Golden Eagles
Arizona Mining Association
Arizona Rough-riders
Arizona State Association of 4-Wheel Drive Clubs
Arizona Wildlife Federation
Carlsbad Sportsman Club
Coachella Valley Fringe-Toed Lizard Habitat Conservation Plan Steering Committee
Coastal and Harbor Hazards Council
Defenders of Wildlife
Desert Bighorn Council
Desert Protective Council
Desert Tortoise Council
El Paso Archaeological Society
El Paso-Trans Pecos Audubon Society
Environmental Defense Fund
Friends of the Earth
Izaak Walton League
League of Women Voters
Messilla Valley Audubon Society
National Audubon Society
National Parks and Conservation Association

National Public Lands Task Force
Natural Resources Defense Council
New Mexico Natural History Institute
New Mexico Wildlife Confederation
Office of Arid Lands Studies
Public Lands Council
Sierra Club
Southern Arizona Environmental Council
Southern Arizona Hiking Club
Southwestern Environmental Service
Southwestern New Mexico Natural History Institute
The Nature Conservancy
Tucson Gem and Mineral Society
Tucson 4-Wheelers
Tucson Rod & Gun Club
Wilderness Society
Wildlife Management Institute
Wildlife Society

(6) Libraries

California

Angelo M. Iacoboni Public Library
Anaheim Public Library, Business, Science & Technical Department
Briggemeyer Memorial Library
California Institute of Technology, Millikan Memorial Library
California State Library, Regional Depository
California Polytechnic University Library
California State University, Long Beach, Library, Documents Department
California State University, Los Angeles, JFK Memorial Library
Claremont College, Honnold Library
Coachella Valley Regional Library
Culver City Library
Desert Hot Springs Public Library
Huntington Park Library, San Antonio Region
Long Beach Public Library
Los Angeles Public Library, Documents Section
Monrovia Public Library
Occidental College Library
Ontario City Library
Palm Desert Public Library
Palm Springs Library Center
Palm Verde Valley District Library
Riverside Central Library,
Riverside Public Library
Government Documents Section
Sacramento State University, Library Documents Department
San Bernardino County Library, Adelanto
San Bernardino County Library, Barstow
San Bernardino County Library, Joshua Tree
San Bernardino County Library, San Bernardino
San Bernardino County Library, Twentynine Palms
San Bernardino County Library, Yucca Valley
San Bernardino (City) Public Library
University of California, Irvine, Bancroft Library
University of California, Irvine General Library, Government Publications Department
University of Redlands, Armacost Library
University of California, Riverside, Library, Government Publications
University of California, Santa Barbara, Library
U.S. Geological Survey Library
West Covina Library

Arizona

Arizona State University Library, Documents Service
Phoenix Public Library
Santa Ana Public Library, Documents Department
University of Arizona, University Library
University of Arizona, Library Documents

New Mexico

Deming Public Library
Energy & Minerals Department Library
Lordsburg Hidalgo Library
New Mexico State Library, Regional Depository

Texas

Brandt Mannchen, Wildlife Chairperson, Lone Star Chapter, Sierra Club
El Paso Public Library, Government Document Section
San Antonio College Library
Southern Methodist University, Fondnen Library
Texas State Library, Austin, Tarleton School of Law
University of Houston School of Law Library
University of Texas, Dallas, Library
University of Texas, San Antonio, Government Documents Department

(7) Individuals

A detailed list of the individuals in the four states who received the draft EIR/EIS is available on request from Mr. William Haigh, BLM, California Desert District, Riverside, California. A list of individuals in California who received the draft EIR/EIS and the NOP is available from Mr. Calvin Hurst, LAHD, San Pedro, California.

(8) SOHIO/All-American Depository Libraries

Depository libraries in California, Arizona, New Mexico, and Texas that received copies of the SOHIO and/or All-American EIR/EIS are listed in Table 5-3.

(9) Draft EIR/EIS Availability

Copies of the draft EIR/EIS are available for inspection at the following locations:

Los Angeles Public Library
San Pedro Branch
921 S. Gaffey Street
San Pedro, CA 90731

Port of Los Angeles
Environmental Management Division
425 S. Palos Verdes Street
San Pedro, CA 90733

Bureau of Land Management
California Desert District
1695 Spruce Street
Riverside, CA 92507

Bureau of Land Management
Sacramento State Office
Federal Office Building
2800 Cottage Way
Sacramento, CA 95825

Bureau of Land Management
Arizona State Office
3707 N. 7th Street
Phoenix, AZ 85014

Bureau of Land Management
New Mexico State Office
Joseph M. Montoya Federal Bldg.
S. Federal Place
P.O. Box 1449
Santa Fe, New Mexico 87504-1449

Bureau of Land Management
Washington Office
Division of Rights-of-Way
18th and C Streets, N.W.
Washington, D.C. 20240

U.S. Army Corps of Engineers
Environmental Resources Branch
300 North Los Angeles Street
Los Angeles, CA 90053

Table 5-3 - EIR/EIS Depository Libraries

Depository Libraries	SOHIO EIS	All-American EIR/EIS
CALIFORNIA		
Anaheim Public Library	X	-
Barstow Branch Library	-	X
California State Library, Sacramento	X	X
California Polytechnic State University	-	X
California State University		
Fullerton	X	-
Long Beach	X	-
Los Angeles	X	-
Sacramento	X	-
Department of Library and Archives, Sacramento	-	X
Edwards Branch Library	-	X
Indio Branch Library	-	X
Kern County Library	-	X
Long Beach Public Library	X	X
Los Angeles Public Library	X	X
Loyola University Law Library	X	-
Los Angeles County Law Library	X	-
Mohave Branch Library	-	X
Needles Branch Library	-	X
Oakland Public Library	-	X
Occidental College	X	-
Orange County Law Library	X	-
Pepperdine University	X	-
Pomona College Library	-	X
Ridgecrest Public Library	-	X
Riverside Public Library	X	X
San Bernardino Central Library	X	X
San Bernardino County Library	X	X
San Diego Public Library	-	X
San Francisco Public Library	-	X
San Luis Obispo City, County Library	X	-
Santa Ana Public Library	X	-
Santa Barbara Public Library	X	-
Santa Maria Public Library	-	X
Santa Rosa Sonoma County Public Library	-	X
Stanford University Library	-	X
University of California		
Berkeley	X	X
Davis	-	X
Irvine	-	X
Los Angeles	X	X
Riverside	X	X
Santa Barbara	X	X
Santa Cruz	-	X
University of Redlands	X	-
University of Southern California	X	-
Ventura County Library	-	X
Victorville Branch Library	-	X

Table 5-3 (Contd)

Depository Libraries	SOHIO EIS	All-American EIR/EIS
ARIZONA		
Arizona State University	-	X
Department of Library and Archives, Phoenix	-	X
Phoenix Public Library	X	X
University of Arizona	X	X
Tucson Public Library	X	-
Yuma City, County Library	X	-
NEW MEXICO		
Deming Public Library	-	X
Energy and Minerals Department Library, Sante Fe	-	X
Lordsburg Hidalgo Library	-	X
New Mexico State Library, Sante Fe	X	X
Thomas Branager Library, Las Cruces	-	X
New Mexico Junior College, Hobbs	X	-
New Mexico State University	X	-
New Mexico Supreme Court Library	X	-
University of New Mexico	X	-
Western New Mexico University	X	-
TEXAS		
Alvin Public Library, Brazoria	-	X
Angelo State University	X	-
El Paso Public Library	-	X
Gonzales Public Library	-	X
Houston Public Library	-	X
Johnson City Public Library	-	X
Nesbitt Memorial Library, Columbus	-	X
Pioneer Memorial Library, Fredericksburg	-	X
Reeves County Public Library, Pecos	-	X
San Antonio College	-	X
Southern Methodist University, Fondren Library	-	X
Texas State Library	X	X
Texas State Law Library	X	-
Texas Tech University	X	-
University of Houston		
School of Law Library	-	X
Victoria Campus Library	-	X
University of Texas		
Tarleton School of Law	X	X
Government Documents Department	-	X
Health and Science Center Library	-	X
University of Texas, El Paso	X	-
Wharton County Public Library	-	X
Winkler County Public Library	-	X

SECTION 6
SUPPORT MATERIAL

SECTION 6

SUPPORT MATERIAL

6.1 GLOSSARY

Absorption	Liquid contaminant immobilization due to filling interstices/capillary attraction in porous, unsaturated soil.
Adsorption	Liquid contaminant immobilization due to molecular attraction/ion exchange on soil particle surface.
Aggradation	A process of shifting equilibrium of stream deposition, with upbuilding approximately at grade.
Alluvial fan	The alluvial deposit of a stream where it issues from a gorge upon a plain or of a tributary stream at its junction with the main stream.
Alluvium	Clay, silt, sand, gravel, or similar detrital material deposited by running water.
Anadromous	Refers to fish that live in the ocean and ascend freshwater streams to spawn.
Annual (ephemeral) plant	Plant that completes life cycle and dies in 1 year or less (Range Term Glossary Committee, 1974).
Anticline	A geologic fold, generally convex upward, whose core contains the stratigraphically older rocks.
Anticyclonic circulation	Wind system rotating about a center of high pressure, clockwise in northern hemisphere.
Aquifer	Water-bearing stratum of permeable rock, sand, or gravel.
Area of Critical Environmental Concern (ACEC)	Area of national or international significance threatened by adverse change; a reduction or loss of values, unless special management attention is applied. With ACEC status, public land is managed to prevent irreparable damage to important historic, cultural, or scenic values; fish and wildlife resources; or other natural systems or processes.
Arroyo	A small steep-sided and usually dry water course with a flat floor.
Authorized Officer	Federal employee assigned the responsibility of overseeing compliance with ROW stipulations during pipeline construction and operation.

A-weighting	A weighting scheme applied to sound level measurements; corresponds approximately to human hearing sensitivity. Expressed as decibels, A-weighted (dBA).
Bajada	Broad alluvial slope extending from the base of a mountain range out into a basin and formed by coalescence of separate alluvial fans.
Barrel	Measure of volume for oil; equals 42 U.S. gallons at atmospheric pressure and 60°F.
Bedrock	Solid rock underlying unconsolidated surface materials.
Benthic	Of, relating to, or occurring at the bottom of a body of water.
Biome (biotic communities)	A major ecological community characterized by a distinctive vegetation, physiognomy, or appearance.
Block valve	Pipeline valve designed to prevent the flow of oil in either direction. May be operated remotely or manually.
Blooms	A period of high, localized marine primary productivity.
Breasting dolphin	A pile or other structure against which a moored ship rests.
Bunkering	Taking fuel on from a barge.
Caliche	Gravel, sand, or desert debris cemented by porous calcium carbonate.
Cathodic protection	An anticorrosion technique for metallic pipelines, tanks, etc., in which weak electric currents are established to offset the current associated with metal corrosion.
Check valve	Pipeline valve designed to automatically prevent the backward flow of oil.
Climax	A relatively stable stage or community, especially plants, that is achieved through successful adjustment to an environment.
CNEL	Community noise equivalent level; similar to L_{dn} but with 5 dBA added to 7:00 p.m. to 10:00 p.m. average noise level and 10 dBA added to the 10:00 p.m. to 7:00 a.m. average noise level.

Colluvium	Rock and soil accumulation at the foot of a slope.
Critical Wildlife Habitat	Part of the habitat of a Federally threatened or endangered wildlife species that is essential for its survival and perpetuation.
Crude Oil	A mixture of hydrocarbons that exists in the liquid phase in natural underground reservoirs, remains liquid at atmospheric pressure after passing through surface separating facilities, includes: (1) Liquids technically defined as crude oil. (2) Small amounts of hydrocarbons that exist in the gaseous phase in natural underground reservoirs but are liquid at atmospheric pressure after being recovered from oil well (casing head) gas in lease separators. (3) Small amounts of nonhydrocarbons produced with the oil.
Day-night sound level	The equivalent sound level over a 24-hour period with a 10-db penalty added to nighttime hours (10 p.m. to 7 a.m.) to account for increased sensitivity by people to noise during that period.
Debris flows	Mass movement of rock and/or mud down steep inclines in association with saturated soils.
Decibel	A unit for expressing the ratio of two amounts of sound power; equal to 10 times the logarithm of this ratio.
Dissolved oxygen	The amount of gaseous oxygen dissolved in water; used as a threshhold level to support marine and aquatic life.
Draft Operations Manual	A draft Operations Manual for the proposed port prepared in accordance with the "Guidelines for Preparation of a Deepwater Port Operations Manual."
Endangered animal species	Any animal species in danger of extinction throughout all or a significant portion of its range. This definition excludes species of insects that the Secretary of the Interior determines to be pests and whose protection under the Endangered Species Act of 1973 would present an overwhelming and overriding risk to man.

Endangered plant species	Species of plants in danger of extinction throughout all or a significant portion of their ranges. Existence may be endangered because of the destruction, drastic change, or severe curtailment of habitat, or because of overexploitation, disease, predation, or unknown reasons. Plant taxa from very limited areas, e.g., the type localities only, or from restricted fragile habitats are usually considered endangered.
Environment	The surrounding conditions, influences, or forces that affect or modify an organism or an ecological community and ultimately determine its form and survival.
Environmental Impact Statement (EIS)	An analytical document developed for use by decisionmakers to weigh the environmental consequences of a potential decision. An EIS should accurately portray potential impacts on the human environment of a particular course of action and its possible alternatives.
Ephemeral stream	A stream that flows only during and after a precipitation event.
Equivalent sound level	The sound level that has the same acoustical energy over a given period of time as the actual time-varying sound. The daytime L_{eq} is the average equivalent sound level produced during daytime hours.
Eyrie (=aerie)	Nest of a bird on a cliff or mountaintop; a brood of birds of prey.
Flammable range	The range of fuel concentrations in air in which ignition of a fuel is possible. The high and low concentration extremes of the range are referred to as the upper and lower limits of flammability.
Flammable vapors	The lighter, more volatile constituents of a flammable liquid that evaporate from the surface of the liquid.
Flue gas	Emissions released from the stack of a ship.
Footprint	The area of seabed affected by the development of a proposed island. The area of land affected by explosions or other hazards.
Fossiliferous	Containing fossils.
g	Acceleration equal to the force of gravity, 32 ft/sec/sec.

Graben	A block of the earth's crust generally with a length much greater than its width that has dropped relative to the blocks on either side.
Gravity, °API	A measure of the specific gravity of oil; the higher the number, the lighter the oil. Water has an API gravity of 10.
Habitat	A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.
Historic	Geologic time referring to approximately the last 200 years.
Holocene	Recent geologic time; refers to approximately the last 11,000 years.
Horizontal acceleration	Rate of change of horizontal ground movement usually expressed in terms of a multiple of acceleration due to gravity (g = 32 ft/sec/sec).
Hydrostatic test	Filling a pipeline or tank with water under pressure to test for tensile strength; its ability to hold pressure without rupturing.
Immiscibility	Incapable of mixing or attaining homogeneity, as with oil and water.
Jones Act	The terms of the Jones Act (Merchant Marine Act, 1920) stipulate that all trade in goods between one U..S. port and another must be carried entirely in ships of U.S. construction, ownership, and operation.
Karst	Limestone region with many sinkholes, abrupt ridges, caverns, and underground streams.
LAHD	Los Angeles Harbor Department.
L_{dn}	The day/night average sound level defined as the 24-hour period L_{eq} with 10 dBA added to the nighttime average level, L_n.
Macrophytes	Aquatic macroscopic plants.
mean lower low tide	The arithmetic mean of all of the lower low tides.
Mesic	Characterized by a moderate amount of moisture.

Metals (in oil)	Trace metals such as vanadium and boron found in crude oil that can shorten the life of catalysts used in the refining process.
Midden	A refuse pile associated with a cultural resource site.
Mooring dolphin	Similar to a breasting dolphin except without a breastline attached.
National Pollutant Discharge Elimination System Information	The information prescribed by, and submitted on, the "National Pollutant Discharge Elimination System (NPDES)" Application for Permit to Discharge for applying for issuance of a discharge permit to the Administrator of the Environmental Protection Agency (EPA).
Neritic	Pertaining to the portion of the pelagic environment that extends from mean low tide to approximately the edge of the continental shelf.
Net under keel clearance	The distance between the ocean bottom and the portion of a tanker's hull closest to the ocean bottom when the tanker is underway, moored or anchored, considering ship motion in responding to the combination of actual wind, wave, tide, and current conditions.
PAD District	One of the five Petroleum Administration for Defense Districts defined by the Bureau of Mines, Department of the Interior.
Percolation	Gravity flow of groundwater through the pore spaces in rock or soil.
Perennial plant	A plant that has a life cycle of 3 years or more.
Perennial stream	A stream that flows throughout the year.
Petroglyph	Pecked or incised figures or designs on boulders, rocks, outcroppings, or within rock shelters.
pH	A measure of acidity; equal to the negative logarithm of the hydrogen ion concentration.
Phreatophyte	A deep-rooted plant that obtains its water from the water table or the layer of soil just above it.
Phytoplankton	Plant plankton. The most important community of primary producers in the ocean.
Pictograph	An ancient or prehistoric drawing or painting on a rock wall.

Pig	Mechanical device sent through the pipeline for purposes that include cleaning, inspecting welds, or controlling slugs of fluid.
Pig launcher	A mechanical system used to launch pigs into the pipeline.
Platform	A fixed structure that rests on or is embedded in the seabed and has floors or decks in which an activity or specific function may be carried out.
Playa	The flat-floored bottom of an undrained desert basin that sometimes becomes a shallow lake.
Pod	A rudely cylindrical mineral body that decreases at the ends (as a cigar does).
Potentiometric heads	The imaginary surface that represents the static head of groundwater and is defined as the level to which water will rise.
Precautionary area	Marine areas designated by the International Maritime Organization where mariners should exercise caution when transiting because of the traffic hazards.
Radiation inversion	A temperature inversion produced by the cooling of the earth's surface and adjacent air occurring whenever the earth's surface suffers a net loss of heat due to terrestrial radiation.
Rangeland (range)	Land dominated by vegetation that can be grazed or browsed and whose husbandry is provided routinely through grazing management instead of renovation or cultural treatment.
Raptor	A bird of prey with sharp talons and strongly curved beak.
Rehabilitation	The process of applying mechanical and/or revegetation techniques to limit soil loss on disturbed sites.
Revetment	A facing, as of stone or concrete to sustain an embankment.
Riparian	Situated on or pertaining to the bank of a river, stream, or other body of water. Riparian is normally used to refer to the plants of all types that grow near bodies of water.

Salinity	Total amount of dissolved solids in seawater in part per thousand by weight when all carbonate is converted to oxide, bromide and iodide to chloride, and all organic matter is oxidized.
Scarp	An escarpment, cliff, or steep slope along the margin of a plateau, mesa, terrace, or bench.
Seismotectonics	The conditions or study of movements in the earth's crust as they relate to earthquake occurrence.
Separation zone or line	A zone or line in the traffic separation scheme located between two traffic lanes to keep tankers proceeding in opposite directions a safe distance apart.
Sleeping circle/rock rings	Rock features associated with temporary occupation, ritual, or storage.
Slumping	Land that exhibits a downward slide, usually in a backward rotating motion.
Sodic	Refers to soils with high sodium concentrations.
Soil liquefaction	A condition where soil strength is greatly reduced because of excessive pore water pressure buildup, especially in saturated sandy soils that are subject to compaction and remolding triggered by earthquake vibrations.
Soluble	Susceptible of being dissolved in a fluid.
Sorting value	A measure of the spread of distribution or uniformity of a given sediment sample. Well-sorted material has a large spread of sediment size, whereas poorly sorted material is more uniform.
Stratus clouds	Clouds of great horizontal extension.
Subsidence area	An area that has settled or sunk.
Subsidence inversion	A temperature inversion produced by the adiabatic warming of a layer of descending air.
Successional	Pertaining to the directional change in the composition of an ecosystem as organisms (especially plants) respond to and modify the environment.
Synoptic conditions	Relating to meteorological conditions as they exist simultaneously over a broad area.
Tectonically	Relating to deformation of the earth's crust.

Threatened animal species	Any animal species likely to become endangered within the forseeable future throughout all or a significant part of its range.
Threatened Plant Species	Any species likely to become endangered within the forseeable future throughout all or a significant portion of its ranges, including species categorized as rare, very rare, or depleted.
Traffic lane	An area of the traffic separation scheme in which all tankers ordinarily proceed in the same direction.
Traffic separation scheme (TSS)	The network of traffic lanes and separation zones or lines at a deepwater port.
Trophic level	A nourishment level in a food chain. Plant producers constitute the lowest level, followed by herbivores and a series of carnivores at the higher levels.
Vegetation type	A plant community with distinguishable characteristics, described by the dominant vegetation present.
Viscosity (centistokes)	The viscosity of oil measured in centistokes; water at 67°F has a viscosity of 1 centistoke.
Volatile	Readily vaporized at a relatively low temperature.
Wetlands	Periodically, seasonally, or continuously submerged landscapes populated by species and/or life forms differing from adjacent communities.
Wilderness	An uncultivated, uninhabited, and usually roadless area set aside for preservation of natural conditions according to section 2(c) of the Wilderness Act of 1964.
Wilderness Study Area (WSA)	A roadless area or island that has been inventoried and found to have wilderness characteristics as described in section 603 of the Federal Land Policy and Management Act and section 2(c) of the Wilderness Act of 1964 (78 Stat. 891).
Zoned fault	State of California zoning designation. Fault areas of high potential surface fault rupture that require special study prior to human occupancy.

6.2 ACRONYMS AND ABBREVIATIONS

ACEC	area of critical environmental concern
ACHP	Advisory Council on Historic Preservation
ACT	Applied Conservation Technology, Inc.
ADL	Arthur D. Little, Inc.
AFS	American Fisheries Society
AGFC	Arizona Game and Fish Commission
ANSI	American National Standards Institute
APCD	Air Pollution Control District
API	American Petroleum Institute
AQMP	Air Quality Management Plan
ASME	American Society of Mechanical Engineers
BACT	best available control technology
bbl	barrel
BEA	Bureau of Economic Analysis
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BOD	biochemical oxygen demand
bpd	barrel per day
bph	barrel per hour
BR	Bureau of Reclamation
Btu	British thermal unit
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CDCA	California Desert Conservation Area
CDFG	California Department of Fish and Game
CDMG	California Division of Mines and Geology
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CMA	California Maritime Academy
CNEL	community noise equivalent level
CO	carbon monoxide
CO_2	carbon dioxide
COE	U.S. Army Corps of Engineers
CRWQCB	California Regional Water Quality Control Board
CU	construction and use (plan)
CVDT	Chuckwalla Valley Dune Thicket
CVFTL	Coachella Valley Fringe-toed Lizard
CVFTL HCP	Coachella Valley Fringe-toed Lizard Habitat Conservation Plan
dB	decibel
dBA	decibel A-weighted
DDT	dichlorodiphenyl trichloroethane
DO	dissolved oxygen
DOD	U.S. Department of Defense
DOT	U.S. Department of Transportation
dwt	deadweight ton
ECE	emission control equipment
ECS	emission control system

EDAC	Engineering Decision Analysis Company
EIA	Energy Information Administration
EIR	Environmental Impact Report (state)
EIS	Environmental Impact Statement (federal)
EOR	enhanced oil recovery
EPA	Environmental Protection Agency
EQA-MBC	Environmental Quality Analysts - Marine Biological Consultants
ERT	Environmental Research & Technology, Inc.
ES	Engineering-Science, Inc.
ESA	ESA Geotechnical Consultants
ESP	electrostatic precipitator
EVC	existing visual condition
FLPMA	Federal Land Policy and Management Act, 1976
FPA	further planning area
FS	U.S. Forest Service
ft	foot
ft^3	cubic foot
ft^3/sec	cubic foot per second
FVC	future visual condition
FWPCA	Federal Water Pollution Control Act
FWS	U.S. Fish and Wildlife Service
gpm	gallon per minute
g/s	gram per second
gww	gram wet weight
HC	hydrocarbon
HCP	Habitat Conservation Plan
HEP	Harbors Environmental Projects
hmw	high molecular weight
hp	horsepower
hr	hour
IGS	inert gas system
in.	inch
ISCST	industrial source complex short term
JBA	Jack R. Benjamin & Associates
JRP	Joint Review Panel
JUMP	Joint Utilities Management Program
kWh	kilowatt-hour
LACM	Natural History Museum of Los Angeles County
LADWP	Los Angeles Department of Water and Power
LAHD	Los Angeles Harbor Department
lb/hr	pound per hour
L_{dn}	average day-night sound level
L_{eq}	equivalent sound level
lin ft	linear foot
lmw	low molecular weight
LPNF	Los Padres National Forest
M	magnitude (Richter)
MBC	Marine Biological Consultants
ug/liter	microgram per liter
ug/m^3	microgram per cubic meter
mgd	million gallon per day
mg/liter	milligram per liter

MLLW	mean lower low water
N_2	nitrogen
NA	nonattainment area
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NMFG	New Mexico Fish and Game
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_x	oxide of nitrogen
NOAA	National Oceanographic and Atmospheric Administration
NOI	notice of intent
NOP	notice of preparation
NPC	National Petroleum Council
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NSR	new source review
NTP	notice to proceed
NWR	National Wildlife Refuge
O_3	ozone
O&M	operations and maintenance
OCS	outer continental shelf
od	outside diameter
OIW	Oceanographic Institute of Washington
OPSO	Office of Pipeline Safety and Operations
ORV	offroad vehicle
OSC	onscene coordinator
OSCP	Oil Spill Contingency Plan
OSHA	Occupational Safety and Health Administration
PADD V	Petroleum Administration for Defense District V
Pactel	Pacific Telephone
Pactex	Pacific Texas Pipeline Company
part.	particulate
PCB	polychlorinated biphenyls
pH	negative logarithm of the hydrogen ion concentration
PHC	petroleum hydrocarbon
PIRS	pollution incident reporting system
POLA	Port of Los Angeles
POLB	Port of Long Beach
ppb	part per billion
ppm	part per million
ppt	part per thousand
PSD	prevention of significant deterioration
psia	pound per square inch atmosphere
psig	pound per square inch gauge
ROG	reactive organic gases
ROS	recreation opportunity spectrum
ROW	right-of-way
RR	railroad
RTU	remote terminal unit
RVD	recreation visitor-day

RWQCB	Regional Water Quality Control Board
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SCOSC	Southern California Ocean Studies Consortium
SCR	selective catalytic reduction
SDP	specific development plans
SEDAB	Southeast Desert Air Basin
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SLC	State Lands Commission
SO_2	sulfur dioxide
SOA	State Operating Authority
SOHIO	Standard Oil Company of Ohio
SPCC	spill prevention control and countermeasure
SPM	semiprimitive, motorized
SWRCB	State Water Resources Control Board
TAPS	Trans Alaska Pipeline System
TDS	total dissolved solids
tpy	ton per year
TSP	total suspended particulates
UPS	uninterruptible power source
USCG	U.S. Coast Guard
USGS	U.S. Geological Survey
VHF	very high frequency
VLCC	very large crude carriers
VMC	visual management class
VOC	volatile organic compound
VQO	visual quality objective
WSA	wilderness study area
wt	weight
yd	yard
yd^3	cubic yard

6.3 LETTERS OF CONSULTATION

In the course of preparing this EIR/EIS, consultation was made with public agencies to obtain information regarding specific environmental concerns. Those letters that provided significant input to the understanding and analysis of the impacts are at the end of this subsection.

(1) Air Quality

Murray, Robert C., South Coast Air Quality Management District, to George Beck, Pacific Texas Pipeline Co.

(2) Endangered Species

Fullerton, E.C., National Marine Fisheries Service, to District Manager, BLM

Kaufman, Nancy, U.S. Fish and Wildlife Service, to Port of Los Angeles

Klett, W. Ellen, U.S. Fish and Wildlife Service, to State Director, BLM

Lewis, James C., U.S. Fish and Wildlife Service, to Diane Concannon, ES

Spear, Michael J., U.S. Fish and Wildlife Service, to State Director, BLM

(3) Noise

Doner, Otto, United Pumps, to Stearns Catalytic Corporation

(4) Oceanography and Marine Biology

Calhoun, Charles, C., U.S. Army Corps of Engineers (COE), to Calvin Hurst, Port of Los Angeles

(5) Safety and Oil Spills

Grace, Edward V., United States Coast Guard, to Calvin Hurst, Port of Los Angeles

South Coast
AIR QUALITY MANAGEMENT DISTRICT
9150 FLAIR DRIVE, EL MONTE, CA 91731 (213) 572-6200

September 7, 1984

Pacific Texas Pipeline Co.
555 E. Ocean Blvd.
Suite 525
Long Beach, CA 90802

Attention: Mr. George Beck

Gentlemen:

The New Source Review emissions for the PACTEX Long Beach-to-Midland pipeline project have been reevaluated. The new emissions estimate reflects the changes in the project outlined in the May 24, 1984 PACTEX application supplement, the July 31, 1984 letter from the District designating tugboat emissions as propulsion emissions under Rule 1306(a)(8)(D), and the August 13, 1984 supplement reevaluating the project construction emissions in light of the proposed changes in the project. Only construction emissions from the permit unit sites were included in the New Source Review, as agreed upon in the July 31, 1984 letter from the District, and the construction emissions were calculated with 0.05 wt.% sulfur fuel used in diesel engines with retarded ignition timing, which is BACT for construction emissions previously agreed upon by the District and PACTEX. The emissions, by site, are:

Port of Long Beach (Navy Mole):

	ROG	NOx	SOx	CO	PM	
Propulsion emissions	14	414	134	74	55	lbs/day
Construction emissions[1]	7	62	1	20	7	lbs/day
Operational emissions[2]	69	1,877	1,566	982	577	lbs/day
Fugitive emissions[3]	17	0	0	0	0	lbs/day

Carson Tank Farm

	ROG	NOx	SOx	CO	PM	
Construction emissions	7	54	1	36	6	lbs/day
Storage tank emissions	192	0	0	0	0	lbs/day
Fugitive emissions[3]	17	0	0	0	0	lbs/day

Rialto Pump Station

	ROG	NOx	SOx	CO	PM	
Construction emissions	2	13	0	4	1	lbs/day
Fugitive emissions[3]	8	0	0	0	0	lbs/day

Blythe Pump Station

	ROG	NOx	SOx	CO	PM	
Fugitive emissions[3]	8	0	0	0	0	lbs/day

[1] Combined emissions for off-shore and on-shore construction.
[2] Calculated with 0.25 wt.% sulfur bunker fuel.
[3] Includes emissions from pumps, valves, and floating roof sump tanks.

Emissions subject to New Source Review

1. Port of Long Beach

The propulsion emissions for the tankers and tugboats are below the Rule 1306(a)(8)(D) threshold limits, and thus do not need to be offset. The construction emissions with the above-described BACT are also below the Rule 1303(a)(2) threshold limits, and do not need to be offset. The operational and fugitive emissions exceed the Rule 1303 limits and thus need to be fully offset. The amount of offsets required, including the 1.1 offset factor are:

ROG	NOx	SOx	CO	PM	
95	2,065	1,723	1,080	635	lbs/day

However, if the innovative technology exemption of Rule 1303(b)(3) is granted for the tanker flue gas scrubbing system proposed in the May 24 supplement; no offsets will be required for the site.

2. Carson Tank Farm

As with the Port of Long Beach site, the construction emissions from the preparation of the Carson tank farm site are below the Rule 1303 threshold limits, and thus do not need to be offset. The storage tank and fugitive emissions exceed the Rule 1303 75 lbs. ROG/day threshold limit, and thus need to be fully offset. The amount of offsets required at the site are:

(192 + 17) x 1.1 = 230 lb. ROG/day

These ROG offsets will be subject to the Rule 1307 distance offset factors if the source of ROG offsets is greater than five miles from the Carson site.

3. Rialto and Blythe Pump Stations

The emissions from these two pump stations do not exceed the Rule 1303 threshold limits, and thus do not need to be offset.

It should be noted that BACT is necessary even in those cases where emissions offsets are not required.

In summary, if the innovative technology exemption is granted for the tanker flue gas scrubbing system, PACTEX will need to offset only the 230 lb. ROG/day operational emissions from the Carson tank farm site. All of the other emissions do not exceed emission threshold limits designated in Regulation XIII.

If you have any further questions, please call Robert Antonoplis at (818) 572-6205.

Very truly yours,

Sanford M. Weiss
Director of Engineering

Robert C. Murray

Robert C. Murray
Senior Engineering Manager

RAA:tc

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southwest Region
300 South Ferry Street
Terminal Island, California 90731

February 8, 1985 F/SWR33:DJS
1514-05

Mr. Gerald E. Hiller
District Manager
Bureau of Land Management
California Desert District
1695 Spruce St.
Riverside, California 92507

Dear Mr. Hiller:

This responds to your January 22, 1985, request for information concerning endangered, threatened, or candidate species that may be affected by the proposed Pacific-Texas pipeline project originating in the Port of Los Angeles.

Two listed species for which the National Marine Fisheries Service is responsible may occur within the project area. The California gray whale (Eschrichtius robustus) listed as endangered, migrates along the California coastline from December through April. Occasionally individual whales may enter the Los Angeles Harbor. The green sea turtle (Chelonia mydas) is listed as endangered. A few individuals have been sighted sporadically in the southernmost portion of the harbor near Alamitos Bay. These turtles are likely transient individuals far north of their breeding range.

Because both species are unlikely to come into contact with this proposed project, we believe that the project is unlikely to affect these species and see no need to proceed further with the consultation process prescribed in Section 7 of the Endangered Species Act.

If you require additional assistance please contact Mr. Dana J. Seagars at (213) 548-2518 or (FTS) 796-2518.

Sincerely yours,

E C Fullerton
E.C. Fullerton
Regional Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE

LAGUNA NIGUEL FIELD OFFICE
24000 Avila Road
Laguna Niguel, California 92677

11 January 1985

Port of Los Angeles
Environmental Analysis
P.O. Box 151
San Pedro, CA 90733

Bureau of Land Management
California Desert Dist.
1695 Spruce St.
Riverside, CA 92507

Re: Pacific Texas Pipeline and Los Angeles Harbor Landfill

Dear Sir:

The Fish and Wildlife Service (FWS) has considered the available information on the referenced project, met informally with the project proponent on 12 December 1984, and attended a scoping meeting on 31 January 1985. This letter responds to the Notice of Preparation, dated 18 January 1985 prepared by the Port of Los Angeles, the Notice of Intent, dated 10 January 1985 prepared by the Bureau of Land Management (BLM), and the endangered species list request dated 22 January 1984 prepared by the BLM. We offer the following comments.

Pursuant to 40 CFR 1501.6, regulations for implementing the National Environmental Policy Act (NEPA), the FWS requests to be a "Cooperating Agency" for the referenced project. At a minimum, we would expect to review and provide comments on predraft EIS chapters pertinent to our agency mission and mandate, to assure that fish and wildlife impacts are adequately described and appropriate mitigation measures are developed. We seek this role because of our long involvement and established expertise in fish and wildlife impact assessment and mitigation, especially in the San Pedro Bay vicinity and southern California. Also, we seek this role because portions of the proposed project will be subject to regulation by State (California Coastal Commission, Port Master Plan Amendment) or Federal agencies (Corps of Engineers, River and Harbor Act Section 10, Clean Water Act Section 404, Marine Protection, Research and Sanctuaries Act Section 103) which will likely consult with the FWS pursuant to the Fish and Wildlife Coordination Act (FWCA) and/or the

Endangered Species Act (ESA). In support of this role, we request that FWS and BLM formulate an interagency agreement which defines each of our agency's responsibilities, including appropriate transfer funding.

In general terms, the outer Los Angeles Harbor portion of San Pedro Bay is a relatively shallow coastal embayment of higher biological value for migratory birds and nearshore marine fishes than offshore waters. See Enclosure 1 for various figures, tables, and literature which are pertinent to the Los Angeles Harbor biota.

The outer Los Angeles-Long Beach Harbors presently supports significant migratory bird and marine fishery resources. The migratory bird community includes about 150 species and two of these are currently endangered with extinction, the California Least Tern and the California Brown Pelican. The least tern nests on Terminal Island in the Port of Los Angeles and forages in the Seaplane Anchorage, Shallow Water Area, south of the new 190-acre landfill, and other harbor waters. The brown pelican is present year round, forages, and roosts in the harbor. Other shorebirds and waterfowl utilize the harbor waters during annual migrations and for overwintering. The most abundant birds include several gull species, the brown pelican, surf scoter, cormorant species, sanderling, and willet. Studies indicate that the shallower areas, such as the vicinities of Cabrillo Beach, Shallow Water Area, and the Seaplane Anchorage are particularly valuable for water-associated birds.

Fish populations are also diverse and abundant with 130 species reported and 70 considered common in occurrence. Several species have consistently ranked high in abundance estimates, they are: white croaker, queenfish, white seaperch, northern anchovy, shiner perch, tonguefish, and speckled sanddab. Other larger, less numerous, but ecologically or recreationally important fishes are: California halibut, barred sand bass, kelp bass, California corbina, Pacific bonito, Pacific barracuda, white seabass, jacksmelt, rockfish species, and shark and ray species.

A biological sampling study, completed in 1981 (SCOSC 1982), of the Seaplane Anchorage and Shallow Water Area indicated a highly significant utilization of these areas, by juvenile and adult California halibut and California corbina, both recreationally and commercially important target species. Also, the outer harbor, especially the shallower areas, is considered to have a significant nursery function for a variety of other coastal marine fishes, such as northern anchovy, croaker species, silversides species, surfperch species, and goby species. These fishery values directly sustain an important recreational fishing industry and indirectly support the nearshore commercial fishing industry.

The adverse biological impacts likely to be caused by the 300-plus acres of dredging and 150-plus acres of landfill (such as disruption of existing current patterns, destruction of bottom

communities, elimination of bird and fish feeding areas) are large, and every effort should be made to minimize them. The FWS will be seeking consideration of less damaging alternatives, such as locating the proposed terminal near Anchorage C-5, at a monobuoy outside the breakwater, or another site, where adequate depths seem to exist, thus reducing the necessary dredging and landfill, or reducing the size of extraneous landfill in the outer harbor.

As stated in the FWS Mitigation Policy, mitigation can be accomplished by avoiding the impact, lessening the impact, and offsetting unavoidable and minimized impacts. This latter principle, offsetting unavoidable and minimized impacts, is termed "loss compensation". Also stated in the Mitigation Policy are the mitigation goals for each of several resource priority categories. We consider the marine habitats within the harbor project scope to be Resource Category 2 meaning that the habitat is of high value and relatively scarce. The mitigation goal for this Resource Category is: no net loss of in-kind habitat value.

We believe that close coordination and a sincere discussion of the potential conflicts and issues can lead to equitable resolution of them. We suggest that the appropriate steps to resolving the fish and wildlife "loss compensation" issues are to: 1) quantify fish and wildlife utilization of the impacted areas (outer LA Harbor fishes have not been sampled since 1978); 2) develop a quantified loss assessment procedure; 3) identify appropriate in-kind loss compensation projects; and 4) develop a quantified procedure for translating the loss into an appropriate loss compensation project. Loss compensation projects may not always be possible inside the harbor; we believe that such projects can be implemented outside the harbor boundaries. Some types of loss compensation projects considered previously include: restoration of tidal influence to existing, diked-off coastal wetlands; creation of coastal wetland habitat from low habitat value upland near existing wetland; construction of "shallow coastal embayment waters" from deeper coastal waters; and construction of artificial reefs.

The FWS is keenly interested in working with the Port of Los Angeles, the BLM, Corps of Engineers, other interested agencies, and the proponent to identify solutions where public fish and wildlife resource interests are in conflict with other public interests. Adequate and detailed analysis of alternatives, assessment of impacts to public fish and wildlife resources, and formulation of loss compensation features are essential to the resolution of such conflicts. We consider the fish and wildlife issues to be extremely important since the contemplated landfill could be very environmentally damaging.

The FWS is also concerned with the potential for significant impacts resulting from the proposed pipeline construction. We consider riparian woodland, oak woodland, wetlands, and vegetated desert washes to be habitats which provide a high habitat value for a wide variety of species, especially for migratory birds.

Because of their high habitat value and relative scarcity, we consider these habitats to be Resource Category 2, in accordance with our Mitigation Policy. Therefore, as with the harbor development proposals, we will be pursuing the mitigation goal of no net loss of in-kind habitat value.

The draft EIR/EIS should thoroughly discuss measures for avoiding impacts to these important habitat types. Should less damaging alternatives be shown infeasible, habitat losses to riparian woodland, oak woodland, wetland, vegetated desert washes, and creosote or sage scrub should be quantified. Again, loss compensation measures should be formulated to offset such unavoidable habitat losses. Revegetation is likely to be the principle loss compensation measure along the pipeline route and specific revegetation plans should be developed for each site of identified habitat loss.

A specific plan which defines areas, plant species to be used, criteria to judge success and a monitoring program for revegetation and erosion should be developed. Erosion control methods should also be developed for the pipeline corridor.

Where the proposed pipeline would cross rivers, streams, or creeks, impacts to aquatic habitats should be addressed with particular attention to native species, recreational fishing, and fish spawning activity. Site specific erosion and sedimentation prevention methods would likely be the appropriate impact avoidance measures and should be thoroughly discussed.

The draft EIR/EIS should also discuss the potential direct and secondary impacts to big game species, such as bighorn sheep and mule deer. Particular attention should be devoted to determining impacts to migration routes, watering holes, and fawning or lambing areas. In the event that significant adverse impacts are identified, impact avoidance by selecting an alternative pipeline alignment or timing of construction should be considered.

We recommend that the draft EIR/EIS also consider the following fish and wildlife subjects: a) oil spill contingency program; b) development of a formal mitigation plan; c) responsibility for and implementation of identified mitigation measures; d) stipulations or conditions which would be considered as attachments to the pipeline right-of-way permit. All seem worthy of discussion.

In response to the BLM request dated 22 January 1985, for information regarding endangered species occurring in the general vicinity of the proposed pipeline and harbor landfill see Enclosure 2 for our listing. The list fulfills the requirements of the FWS to provide a list of species under Section 7(c) of the ESA. We have included endangered, threatened, proposed, or candidate species in this list. Only species listed as endangered or threatened receive protection under the ESA.

The BLM has the responsibility to prepare a biological assessment (see Enclosure 3). The biological assessment may be consolidated with the interagency cooperation procedures required by the NEPA and the FWCA. When completed, a copy should be sent to our office. If this assessment is not initiated within 90 days of your receipt of this letter, the accuracy of the enclosed list should be verified with us informally. The biological assessment should be incorporated into the draft EIR/EIS.

If a listed species may be affected, the Federal lead agency should request, in writing through our office, formal consultation pursuant to Section 7 of the ESA. We suggest that the BLM confirm with the Corps of Engineers that the BLM is the lead agency, with respect to compliance with the ESA. It seems apparent that necessary permits would have to be issued by the CE for the proposed harbor development landfill. This may equal the BLM's magnitude of involvement in considering permission for the interstate pipeline.

The CE had, in 1983 and 1984, initiated formal Section 7 Consultations regarding pending permit applications for proposed projects which were similar to the subject harbor proposal. In 1985, they again requested a species list in anticipation of a Federal construction project in the same vicinity.

Candidate and proposed species should receive consideration in the planning process as conflicts may be avoided in the event that these species become listed prior to project completion. An informal conference process should be used to assess impacts and develop impact avoidance measures for proposed species. Informal consultation may also be used to exchange information and resolve conflicts with respect to the listed species prior to written request for formal consultation.

We are concerned that all the issues mentioned above, be forthrightly and expeditiously addressed. Deferral of issues to the eleventh hour or consideration of necessary permits or approvals prior to resolution can result in delay that serves no public interest.

For purposes of coordination and consultation, pursuant to the National Environmental Policy Act, the Fish and Wildlife Coordination Act, and the Endangered Species Act, please contact:

Fish and Wildlife Service
Laguna Niguel Field Office
24000 Avila Road
Laguna Niguel, CA 92677
coml. (714) 643-4270
FTS 796-4270

The assigned FWS staff personnel are: Mr. Jack Fancher for the Los Angeles Harbor portion of the proposed project and Mr. Martin Kenney for the portion of the proposed pipeline within the State of California.

Please contact this office at your earliest convenience, regarding our status as Cooperating Agency, the proposed interagency agreement, transfer funding, and an overflight of the proposed pipeline corridor. We suggest that BLM convene an interagency meeting of potential regulatory, and cooperating agencies very soon.

Sincerely yours,

Wayne D. Harper

for Nancy M. Kaufman
Field Supervisor

Enclosures 1, 2, & 3

cc: CE, Reg Br, Los Angeles
EPA, Reg IX, San Francisco
NMFS, Terminal Island
CDFG, MRR & Reg 5, Long Beach
CCC, San Diego

ENCLOSURE TWO

LISTED AND PROPOSED AND CANDIDATE
ENDANGERED AND THREATENED SPECIES
THAT MAY OCCUR IN THE AREA OF THE
PROPOSED PACIFIC TEXAS PIPELINE AND LOS ANGELES HARBOR TERMINAL
Los Angeles, Riverside and San Bernardino Counties, California

LISTED SPECIES

FISHES
Colorado squawfish, Ptychocheilius lucius (E)
Bonytail chub, Gila elegans (E)
Mojave tui chub, Gila bicolor mohavensis (E)
Unarmored threespine stickleback,
Gasterosteus aculeatus williamsoni (E)

AMPHIBIANS
Desert slender salamander, Batrachoseps aridus (E)

REPTILES
Coachella Valley fringe-toed lizard, Uma inornata (T)

BIRDS
Yuma clapper rail, Rallus longirostris yumanensis (E)
California least tern, Sterna antillarum browni (E)
California brown pelican, Pelecanus occidentalis californicus (E)
Southern bald eagle, Haliaeetus leucocephalus (E)
Peregrine falcon, Falco peregrinus (E)

PROPOSED SPECIES

FISHES
Desert pupfish, Cyprinodon macularis

CANDIDATE SPECIES

FISHES
Humpback sucker, Xyrauchen texanus (2)

MAMMALS
Stephen's kangaroo rat, Dipodomys stephensi (2)
Yuma puma, Felis concolor browni (2)

(E) - Endangered (T) - Threatened

(1) - Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.
(2) - Category 2: Taxa which existing information indicates may warrant listing, but for which substantial biological information to support a proposed ruling is lacking.

CANDIDATE SPECIES continued

REPTILES
Desert tortoise, Scaptochelys (=Gopherus) agassizii (2)
Orange-throated whiptail, Cnemidophorus hyperythrus (2)
Gila monster, Heloderma suspectum (2)
San Diego horned lizard, Phrynosoma coronatum blainvillei (2)
Flat-tailed horned lizard, Phrynosoma m'calli (2)

BIRDS
Fulvous whistling duck, Dendrocygna bicolor (2)
Swainson's hawk, Buteo swainsoni (2)
Ferruginous hawk, Buteo regalis (2)
California black rail, Laterallus jamaicensis coturniculus (2)
Western snowy plover, Charadrius alexandrinus nivosus (2)
Mountain plover, Charadrius montanus (2)
Western yellow-billed cuckoo, Coccyzus americanus occidentalis (2)
Coastal black-tailed gnatcatcher, Polioptial melanura californica (2)
Least Bell's vireo, Vireo bellii pusillus (1)
Tricolored blackbird, Agelaius tricolor (2)

---

(1) - Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.
(2) - Category 2: Taxa which existing information indicates may warrant listing, but for which substantial biological information to support a proposed ruling is lacking.

CANDIDATE SPECIES continued

INVERTEBRATES *
Coachella giant sand treader cricket, Macrobanetes valgum (2)
Coachella Valley Jerusalem cricket, Stenopelmatus cahuilaensis (2)
Mojave Desert blister beetle, Lytta inseperata (2)
Henne's eucosman moth, Eucosma hennei (2)
Badwater snail, Assiminea infima (2)
Colorado desert snail, Micrarionta morongoana (2)

PLANTS **
Coachella milk vetch, Astragalus lentiginosus var. coachellae (1)
Slender-horned spineflower, Centrostegia leptoceras (1)
Alverson's pincushion cactus, Coryphantha vivipara var. alversonii (2)
California ditaxis, Ditaxis californica (2)
Many-stemmed liveforever, Dudleya multicaulis (2)
Santa Ana River eriastrum, Eriastrum densiflorum spp. sanctorum (2)
Flat-seeded spurge, Euphorbia platysperma (2)
Roderick's fritillary, Fritillaria gravana (2)
Los Angeles sunflower, Helianthus nuttallii spp. parishii (2)
Little San Bernardino mountain linanthus, Linanthus maculatus (2)
Nevin's barberry, Mahonia nevinii (1)
Pringle monardella, Monardella pringlei (1)
Robison monardella, Monardella robisonii (2)
Polygonum fusiforme (2)
Salvia greatae (2)
Mohave fishhook cactus, Sclerocactus polyancistrus (2)
Orcutt's aster, Xylorhiza orcuttii (2)

---

* The enclosed list of candidate invertebrate species will be expanded pending confirmation of locations of additional species; additions to the list will be provided as they become available. The list may change as alternative pipeline routes are developed or new information becomes available.

** Plant species are given which may occur within a corridor extending one mile on either side of the proposed pipeline route. The list may change as alternative pipeline routes are developed or new information becomes available.

CANDIDATE THREATENED OR ENDANGERED INVERTEBRATE SPECIES
REVISED 19 MARCH 1985

LOS ANGELES HARBOR TERMINAL AND PACIFIC TEXAS PIPELINE

Invertebrates	
Coachella giant sand-treader cricket	Macrobaenetes valgum (2)
Coachella Valley Jerusalem cricket	Stenopelmatus cahuilaensis (2)
Greenest tiger beetle	Cincindela tranquebarica viridissima (2)
Mojave desert blister beetle	Lytta insperata (2)
Wandering skipper	Pseudocopaeodes eunus eunus
Henne's eucosman moth	Eucosma hennei (2)
California brackish water snail	Tryonia imitator (2)
Badwater snail	Assiminea infima (2)
Colorado Desert snail	Micrarionta morongoana (2)
California McCoy snail	Micrarionta rowelli mccoiana (2)

REFERENCES

GREENEST TIGER

Fall, H.C. 1910. Miscellaneous notes and descriptions of North American Coleoptera. Trans. Am. Ent. Soc. 36:39.

Casey, T.L. 1913. Studies in the Cincindelidae and Carabidae of America. Memoirs on the Coleoptera. 4:7, 20.

WANDERING SKIPPER

Emmel, T.C. and J.F. Emmel. 1973. The Butterflies of Southern California. Natural History Museum of Los Angeles County.

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

PACTEX PROJECT
SE

POST OFFICE BOX 1306
ALBUQUERQUE, NEW MEXICO 87103

MAR 6 1985

2-01-84-I-01

Memorandum

TO: State Director, Bureau of Land Management, Sacramento, California

FROM: Acting Regional Director, FWS, Region 2 (AFF)

SUBJECT: Updated Species List for Pacific-Texas (Pac-Tex) Pipeline

This responds to your request of January 22, 1985, for an updated species list for the subject pipeline. Please add the following species to the January 27, 1984, list:

Line Segment

Guadalupe to Carlsbad

Lloyd's hedgehog cactus (Echinocereus lloydii) - (E)
New Mexico ramshorn snail, family Planorbidae (undescribed genus and species) - candidate Category 1

Casa Grande - Coolidge

Tumamoc globe-berry (Tumamoca macdougalii) - candidate Category 1

Colorado River - Los Angeles Harbor Terminal

Colorado squawfish, Ptychocheilius lucius (E)
Bonytail chub, Gila elegans (E)
Mojave tui chub, Gila bicolor mohavensis (E)
Unarmored threespine stickleback, Gasterosteus aculeatus williamsoni (E)
Desert slender salamander, Batrachoseps aridus (E)
Coachella Valley fringe-toed lizard, Uma inornata (T)
Yuma clapper rail, Rallus longirostris yumanensis (E)
California least tern, Sterna antillarum browni (E)
California brown pelican, Pelecanus occidentalis californicus (E)
Bald eagle, Haliaeetus leucocephalus (E)

Peregrine falcon, Falco peregrinus (E)
Desert pupfish, Cyprinodon macularis - Proposed
Least Bell's vireo, Vireo bellii pusillus - candidate Category

---

(E) - Endangered (T) - Threatened

Candidate Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.

W. Ellis Elliott

IN REPLY REFER TO:

SE

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

POST OFFICE BOX 1306
ALBUQUERQUE, NEW MEXICO 87103

March 21, 1985

Diane Concannon
Engineering Sciences
E. Annex 309
100 W. Walnut
Pasadena, CA 91124

Dear Ms. Concannon:

You inquired about whooping crane use of the Willcox Playa, Arizona, area as winter habitat, frequency of use, numbers of whoopers, and the dates of use. A yearling whooping crane was seen 26 December 1980 by Dr. Perkins of the University of Arizona. It was wintering at Willcox Playa, Cochise County, Arizona, until March 1981. That is the first and only confirmed record of a whooper in Arizona. Dr. Rod Drewien, University of Idaho professor studying the whooping crane flock that winters in New Mexico, reports the receipt of an unconfirmed sighting report by a Dr. Spofford east of Willcox, Arizona. I have no further detail on the Safford sighting.

I have no specific information on the movements and habitat use of the whooping crane at Willcox Playa in 1980-81. Willcox Playa is 415 km^2. Arizona Game and Fish Department personnel may have information on the specific areas of use. You might contact Philip Smith, 2222 West Greenway Road, Phoenix, Arizona 85023, or phone 942-3000 for further information Based on a small scale map I have showing the proposed pipeline route, it appears that the pipeline might run north of Willcox Playa. The pipeline also passes through southwestern New Mexico, an area infrequently used by whooping cranes.

Sincerely yours,

James Lewis

James C. Lewis
Whooping Crane Coordinator

cc: G. Halvorson, Region 2 (SE)

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

SE

POST OFFICE BOX 1306
ALBUQUERQUE, NEW MEXICO 87103

RECEIVED

JAN 27 1984

Cons. No. 2-01-84-I-01

MEMORANDUM

To: Mr. D. Dean Bibles, State Director, Bureau of Land Management, Phoenix, Arizona

From: Regional Director, Region 2 (SE)

Subject: Species List for Pacific Texas (Pac-Texas) Pipeline

This is in response to your letter dated December 15, 1983, concerning the Pacific Texas (Pac-Texas) Pipeline. As provided by Section 7 of the Endangered Species Act, the U.S. Fish and Wildlife Service furnishes, upon request, a list of federally listed and proposed species that may be affected by Federal actions. The Regional Office of Endangered Species has used the information in your request to narrow the list of listed and proposed species which occur along the pipeline from Blythe, California, to Midland, Texas, to those that potentially may be affected by the proposed action (see attachment).

If the Federal action is considered a major action significantly affecting the quality of the human environment, the Federal agency authorizing, funding, or carrying out the Federal action will conduct a biological assessment to determine whether or not the Federal action will affect listed or proposed species. Preparation of the assessment may begin upon receipt of the U.S. Fish and Wildlife Service's species list.

The biological assessment shall be completed within 180 days after receipt of the species list, unless it is mutually agreed to extend this period. If the assessment is not initiated within 90 days after receipt of the species list, I suggest its accuracy be verified before conducting the assessment.

The biological assessment should include as a minimum:

1) onsite inspection of the area affected by the proposed activity or program, including a detailed survey of the area to determine if species are present and whether suitable habitat exists for either expanding the existing population or potential reintroduction of populations;

2) interviews with recognized experts on the species at issue, including personnel of the U.S. Fish and Wildlife Service, of State conservation departments, of universities, and others who may have data not yet found in scientific literature;

3) review literature and other scientific data to determine the species distribution, habitat needs, and other biological requirements;

4) review and analysis of the effects of the proposed action on individuals and populations, including consideration of both direct and indirect effects of the proposal on the species and its habitat;

5) analysis of alternative actions that may promote conservation of the species;

6) other relevant information;

7) written report documenting the assessment results.

If the Federal permitting action is not a major action significantly affecting the quality of the human environment, there is no need to prepare a biological assessment. However, it remains incumbent upon the Federal agency to assess whether its action may affect endangered and threatened species.

If the Federal agency determines that its proposed action may affect listed species, the Federal agency shall initiate the formal Section 7 consultation process by writing to the Regional Director, Region 2, U.S. Fish and Wildlife Service, P.O. Box 1306, Albuquerque, New Mexico 87103. If no effect is evident, there is no need for further consultation. However, I would appreciate the opportunity to review your biological assessment.

In addition, the Act (Sec. 7(a)(4)) requires Federal agencies to confer with the Service on any agency action likely to either jeopardize the continued existence of any species proposed for listing as endangered or threatened or adversely modify proposed critical habitat. The purpose of this requirement is to identify and to resolve at the early planning state of an action all potential conflicts between the action and the respective species and critical habitat. The informal Section 7 consultation process can accomplish this requirement.

Candidate species include those listed in a "Notice of Review" in the "Federal Register," those species which are in the process of being listed, or those which have been proposed for listing in the past but

later withdrawn in order to comply to new regulations. Candidate species have no legal protection under the Endangered Species Act, and are included here only so that they may be considered in the planning process.

If you have need of further assistance, please call the Office of Endangered Species at (505) 766-3972 or FTS 474-3972.

Sincerely yours,

/s/ Michael J. Spear

~~Regional~~ Director

Attachment

cc: Field Supervisor, ES Field Office, Phoenix, Arizona
Field Supervisor, ES Field Office, Albuquerque, New Mexico
Field Supervisor, ES Field Office, Fort Worth, Texas
Field Supervisor, SE Field Office, Sacramento, California
Mr. Gerald E. Hillier, District Manager, BLM, Riverside, California

PACIFIC TEXAS PIPELINE
Blythe, California to Midland, Texas

PIPELINE SEGMENT	SPECIES	SPECIES CATEGORY* Listed E	Listed T	Listed CH	Proposed E/T	Proposed CH	Candidate
Blythe-Livingston	--Yuma clapper rail	X					
	Peregrine falcon	X					
	Bald eagle	X					
Livington-Gila	--Peregrine falcon						
Gila-Casa Grande	--Peregrine falcon						
	Neolloydia erectrocentra var. acunensis						X
Casa Grande-Coolidge	--Peregrine falcon						
	Yuma clapper rail						
	Gila chub						X
Coolidge-San Pedro	--Gila chub						
	Peregrine falcon						
San Pedro-Cochise	--Peregrine falcon						
	-Whooping crane	X					
	Gila chub						
	Coryphantha robbinsorum						X
Cochise-Deming	--Peregrine falcon						
Deming-Anthony	--None						
Anthony-Guadalupe	--Peregrine falcon						
	Sneed's pincushion cactus (Coryphantha sneedii var. sneedii)	X					
Guadalupe-Carlsbad	--McKittrick pennyroyal (Hedeoma apiculatum)		X				
	Lee's pincushion cactus (Coryphantha sneedii var. leei)	X	X				
	Pecos gambusia	X					
Carlsbad-Jal	--None						
Jal-Midland Terminal	--None						

*E-endangered, T-threatened, CH-critical habitat

Candidate species have no legal protection under the Endangered Species Act but are species for which the Service has substantial information to support their listing as endangered or threatened. The development and publication of proposed rules for each species is anticipated. The candidate species are included in this document for planning purposes only.

HABITAT INFORMATION

Listed Species

Yuma clapper rail	- Inhabits marshes along Colorado River and reported from Picacho Reservoir, Arizona.
Peregrine falcon	- Breeds in cliff areas near water. A summer and winter inhabitant.
Bald eagle	- Breeds along Salt and Verde Rivers. Winters near major rivers and reservoirs Statewide.
Whooping crane	- Occasionally uses Wilcox Playa during winter.
McKittrick pennyroyal	- Found in Guadalupe Mountains, Culbertson County, Texas, and Eddy County, New Mexico. Restricted to limestone rock surfaces between approximately 5,500 to 8,000 feet elevation.
Lee's pincushion cactus	- Occurs in southwest Eddy County, New Mexico. Grows mostly on limestone rocks of north facing slopes at approximately 4,000 to 6,000 feet elevation.
Pecos gambusia	- Found on Bitter Lakes National Wildlife Refuge (Chavez County) and Blue Spring (Eddy County), New Mexico.

UNITED CENTRIFUGAL PUMPS

MAIN OFFICES AND PLANTS: 1132 NORTH 7TH ST., SAN JOSE, CA 95112 • (408) 298-0123
SALES OFFICES: BATON ROUGE • DENVER • HOUSTON • LOS ANGELES
NEW YORK • SAN FRANCISCO • TULSA • CHICAGO

PLEASE ADDRESS REPLY TO:
5200 SOUTH YALE, SUITE 601
TULSA, OKLAHOMA 74135
(918) 496-3666

February 27, 1985

PACTEX-PROJECT
MAR 06 1985
ENGINEERING-SCIENCE, INC.
Doc # 0306-SCC282

Stearns Catalytic Corp.
P. O. Box 5888
Denver, Colorado 80217

Attention: Mr. Raymond O. Gibson

Subject: Pacific Texas Pipeline Co.
United File T-3222

Gentlemen:

The approximate noise level for the 20x27 BFD 2 stage pump would be within 91 dBA measured three feet from surfaces of pump when properly installed and operating at ± 10% of design capacity.

Driver sound level is not included and no guarantee is implied on the combined sound level of operating trains.

Yours very truly,

UNITED CENTRIFUGAL PUMPS

Otto Doner

OD/rb

File/LYK/WCH/DWR

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P.O. BOX 631
VICKSBURG, MISSISSIPPI 39180-0631

REPLY TO ATTENTION OF

WESCW-P

April 2, 1985

PACTEX-PROJECT

CITY OF LOS ANGELES
RECEIVED
APR 16 1985
ENVIRONMENTAL ANALYSIS
HARBOR DEPARTMENT

APR 16 1985

ENGINEERING-SCIENCE, INC.

Mr. W. Calvin Hurst
Port of Los Angeles
P. O. Box 151
San Pedro, California 90733-0151

Dear Mr. Hurst:

In response to your letter of March 11, 1985, and at the recommendation of the Corps of Engineers Los Angeles District, the effect of the Pacific Texas Pipeline Project (PACTEX) terminal (Encl 1) on tidal circulation and harbor oscillation in Los Angeles and Long Beach (LA-LB) Harbors has been examined. This preliminary estimation of effects is not based on specific model studies of the PACTEX terminal but rather on experience with studies of somewhat similar plans for LA Harbor performed at the US Army Engineer Waterways Experiment Station (WES). For example, physical model harbor oscillation and numerical model tidal circulation studies of the Deep-Draft Dry Bulk Export Terminal, Alternative No. 6 (Encl 2) recently have been completed at WES. The PACTEX terminal plan occupies approximately the southeastern one-third of the outer harbor location required for the dry bulk terminal.

An evaluation of the impact of the PACTEX terminal on tidal circulation can be aided by examination of velocity vector plots. Encl 3 shows the plan overlaid on existing spring tide current vectors during flood flow as the harbor is filling. The location of the plan is near the center of the circulation gyre created by the incoming tidal flow. This flow pattern is generally maintained during ebb flow also, with stronger westward flow existing along the middle breakwater and exiting through Angel's Gate (Encl 4). It appears that this location of the PACTEX terminal would permit the general circulation pattern of the outer harbor region to be maintained, unlike the change effected by the dry bulk terminal on flood flow (Encl 5). The dry bulk terminal significantly blocked easterly flow along Terminal Island and the existing condition gyre was nullified. This resulted in directing more of the incoming flow through Angel's Gate along the Main Channel toward the LA inner harbor. This in turn resulted in a reversal of net tidal flow in the inner harbors of LA-LB. Since the PACTEX terminal does not appear to change outer harbor circulation, significant changes in tidal circulation in the inner harbor would not be expected. The major physical changes produced by the PACTEX terminal plan,

that of dredging channels and of landfilling, would tend to balance one another. The plan would increase the cross section at Angel's Gate by about 15 percent. Previous studies indicate reductions in velocity (though not flow volume) at the entrance for greater entrance channel cross-sectional area. The landfill would displace about 35×10^6 cu ft of tidal prism for a 7-ft spring tide range. This would tend to decrease flow volume through Angel's Gate since the landfill is in a region where the outer harbor is filled by flow through Angel's Gate. However, it is very difficult to determine the total combined effect without a detailed numerical model study. Also the effect on net flow in the inner harbor would be difficult to determine without additional studies since the net flows are relatively small compared to total flow.

The effects on tidal elevations due to the plan should be minimal to non-existant. The larger dry bulk terminal had no effect on tidal elevation or phase.

With respect to dye studies performed for the dry-bulk terminal, where dye was injected at the outer harbor sewage outfall (see Encl 2 for location), dye patterns for the PACTEX terminal most likely would be similar to those for existing conditions since it appears that the PACTEX terminal would have outer harbor circulation patterns similar to existing conditions.

The proposed PACTEX terminal plan will have its docking terminal in about the same location as the south face of the dry-bulk terminal plan and harbor oscillation data collected at Gages 31 and 32 of the dry-bulk study most likely would be representative of long-period wave conditions that might occur there. However, it is much more difficult to predict the effect of the PACTEX terminal on mooring locations at other locations in the harbor. Most likely, due to its relatively small size, changes of harbor oscillations from existing conditions at other locations will be minimal.

In summary, the location of the proposed PACTEX terminal falls approximately near the center of the existing condition circulation gyre in the outer harbor. Therefore, it would be expected that outer harbor tidal circulation should be minimally affected when compared to existing conditions. Effects on inner harbor circulation are more difficult to determine without detailed numerical studies. Harbor oscillation changes most likely would be small.

If any questions should arise concerning this review, please contact Mr W. C. Seabergh (601-634-3788) directly.

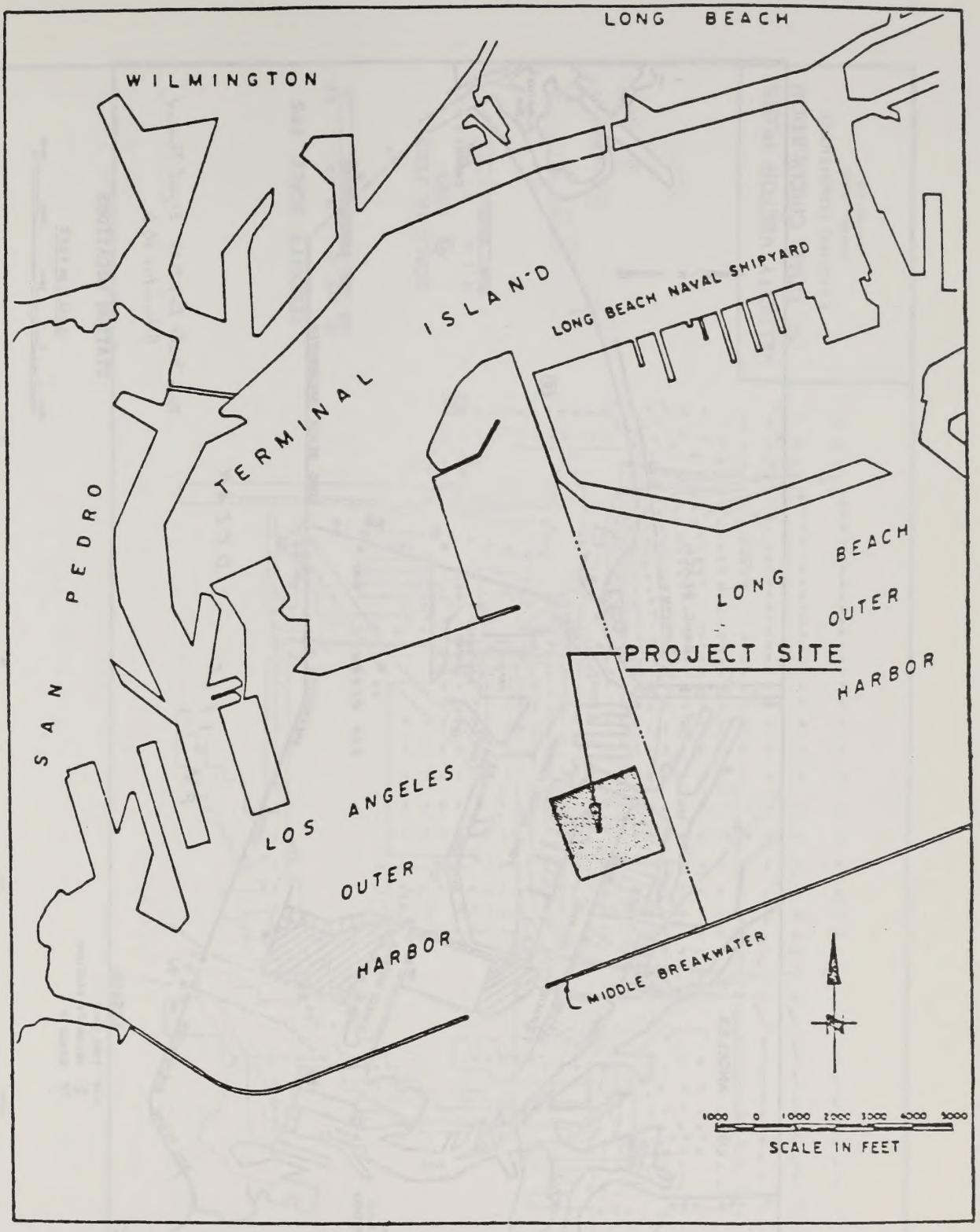
Sincerely,

for Charles C. Calhoun, PE
Acting Chief
Coastal Engineering Research Center

Enclosures

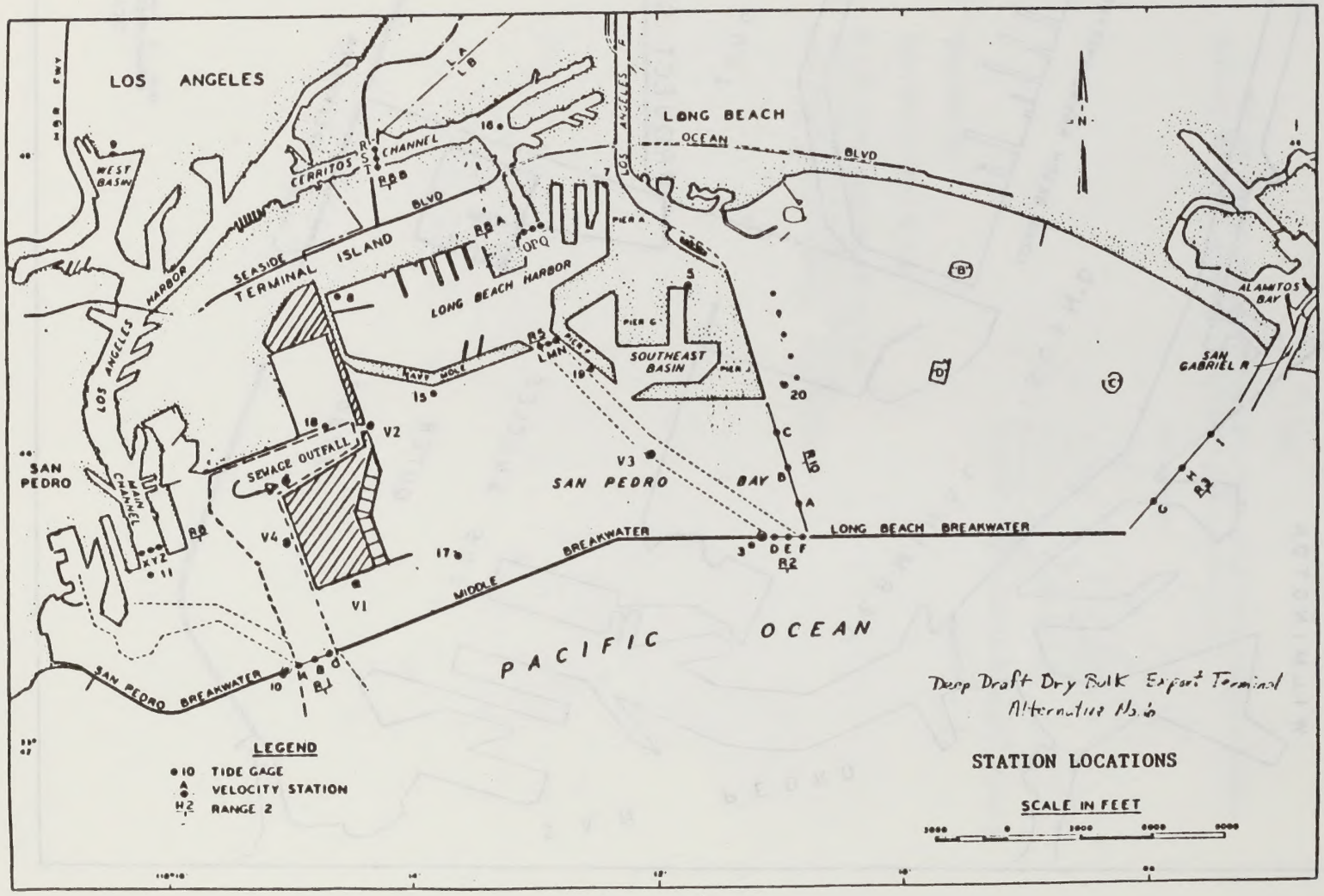
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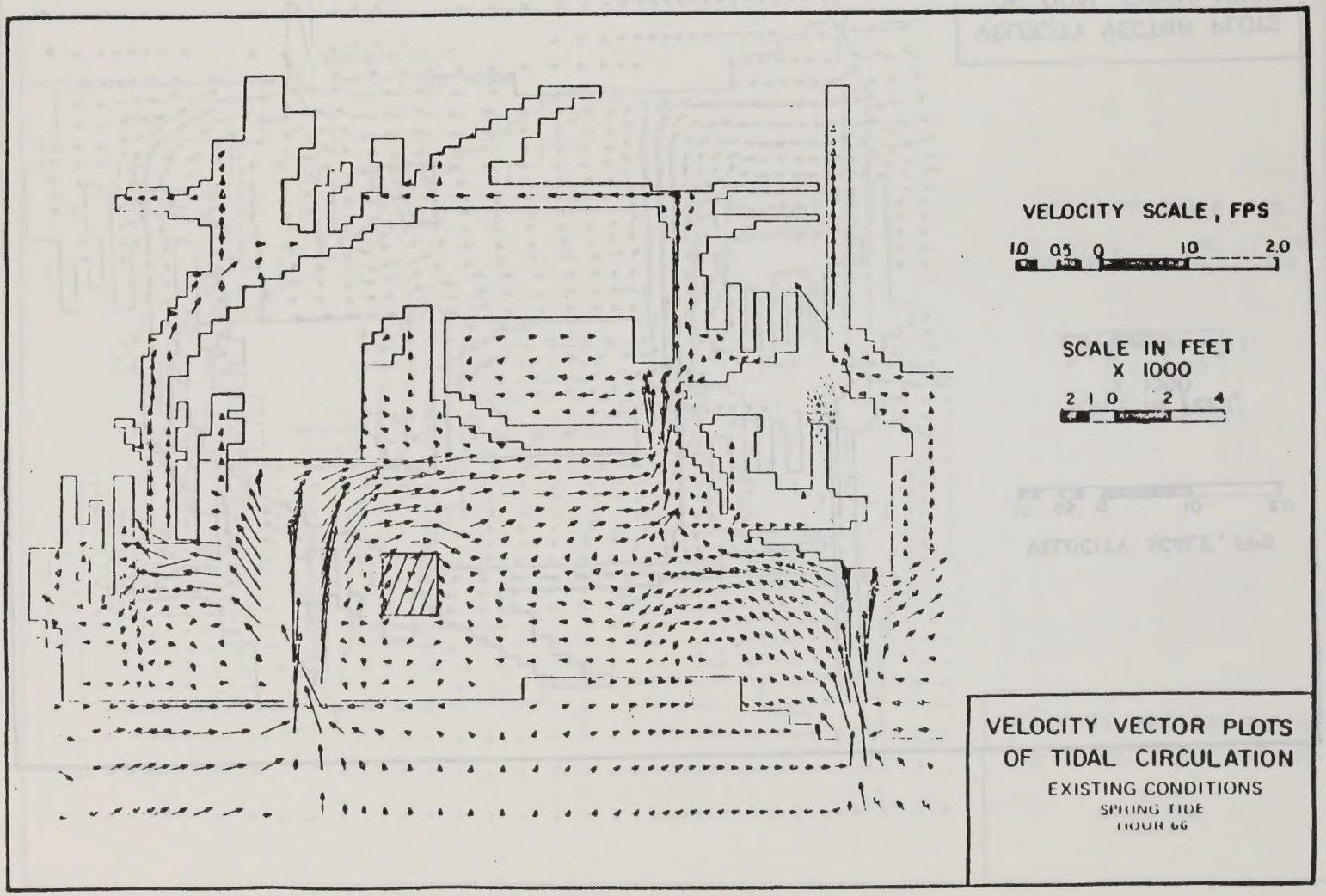
U. S. Army Engineer District
ATTN: Mr. Dan Muslin (SPLPD-C)
Los Angeles, California 90053-2325

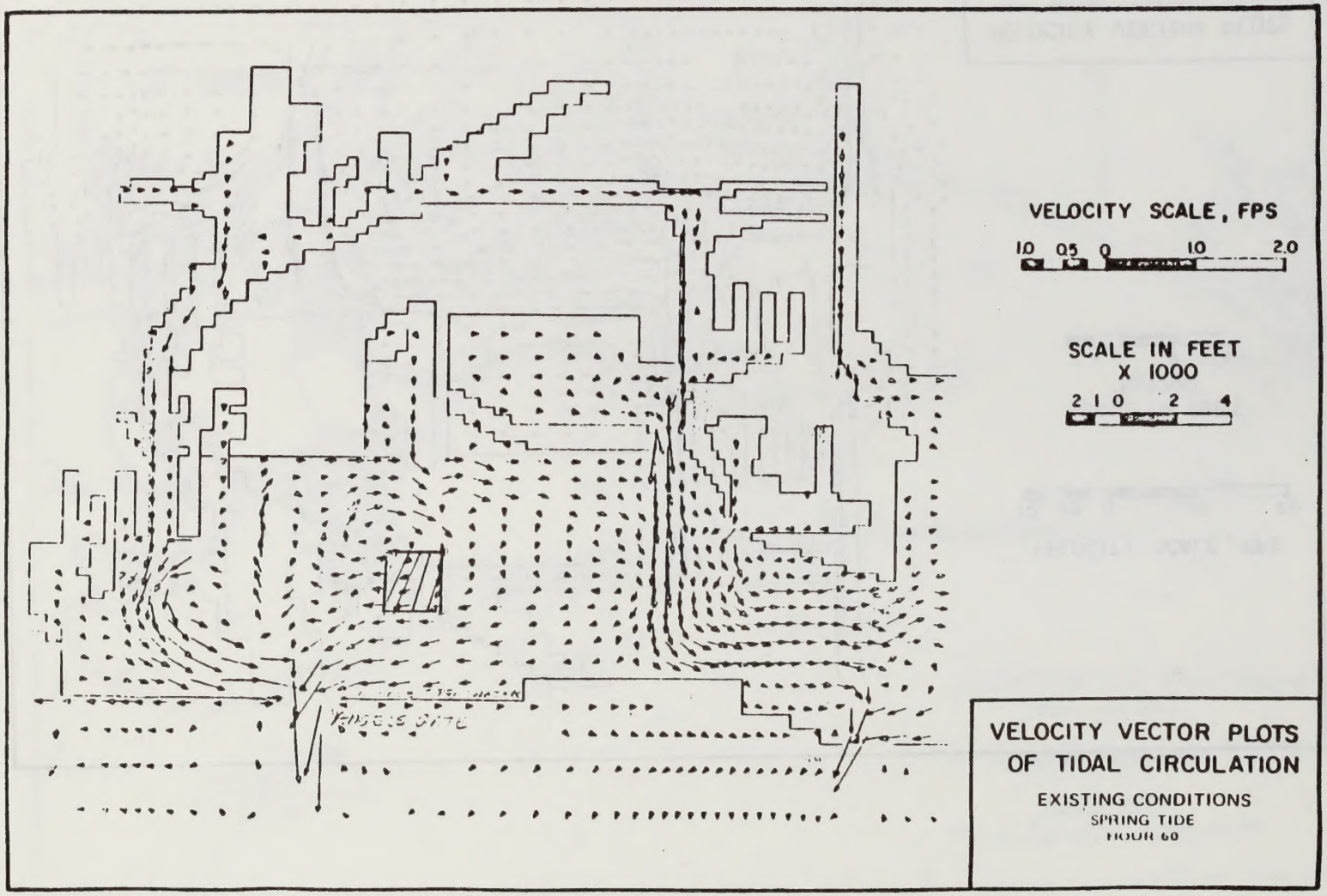


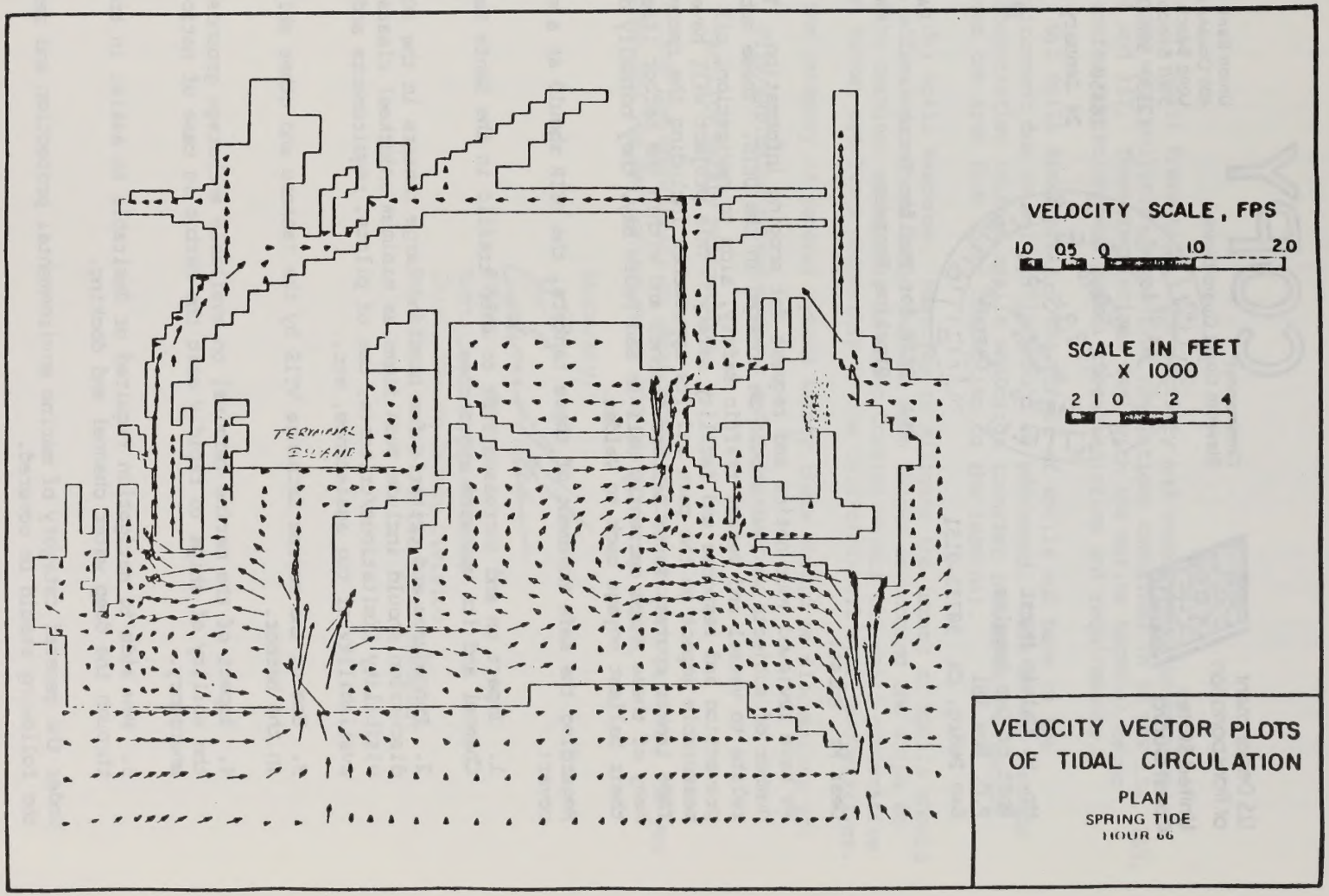
LOCATION MAP

FIGURE 1


LOS ANGELES
LONG BEACH
OCEAN BLVD
WEST BASIN
CERRITOS CHANNEL
SEASIDE BLVD
TERMINAL ISLAND
LONG BEACH HARBOR
HARBOR
LOS ANGELES
SOUTHEAST BASIN
SAN GABRIEL R
ALAMITOS BAY
SAN PEDRO
MAIN CHANNEL
SEWAGE OUTFALL
SAN PEDRO BAY
LONG BEACH BREAKWATER
MIDDLE BREAKWATER
SAN PEDRO BREAKWATER
PACIFIC OCEAN
V1
V2
V3
V4
LEGEND
10 TIDE GAGE
VELOCITY STATION
RANGE 2
Deep Draft Dry Bulk Export Terminal
Alternative No. 4
STATION LOCATIONS
SCALE IN FEET


VELOCITY SCALE, FPS
1.0 0.5 0 1.0 2.0
SCALE IN FEET
X 1000
2 1 0 2 4
VELOCITY VECTOR PLOTS
OF TIDAL CIRCULATION
EXISTING CONDITIONS
SPRING TIDE


VELOCITY SCALE, FPS
1.0 0.5 0 1.0 2.0
SCALE IN FEET
X 1000
2 1 0 2 4
VELOCITY VECTOR PLOTS
OF TIDAL CIRCULATION
EXISTING CONDITIONS
SPRING TIDE
HOUR 60


TERMINAL
ISLAND
VELOCITY SCALE, FPS
1.0 0.5 0 1.0 2.0
SCALE IN FEET
X 1000
2 1 0 2 4
VELOCITY VECTOR PLOTS
OF TIDAL CIRCULATION
PLAN
SPRING TIDE
HOUR 66

COPY

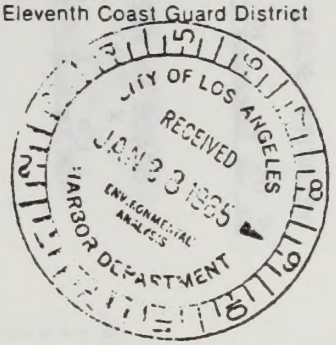
U.S Department of Transportation
United States Coast Guard



Commander
Eleventh Coast Guard District

Union Bank Bldg.
400 Oceangate
Long Beach, CA 90822
Staff Symbol: (mes)
(213) 590-2301

16450
24 January 1985



RECEIVED
JAN 29 1985
PAUL E. SMOKLER
Doc # 0129-LAH049

Mr. W. Calvin Hurst
Port of Los Angeles
P.O. Box 151
San Pedro, CA 90733-0151

Re: DEIR for Pacific Texas Pipeline Project

Dear Mr. Hurst:

We have reviewed your notice and request for scoping information. There are a number of subjects we feel should be covered in the DEIS. These subjects relate to vessel and vessel traffic safety, aids to navigation, oil spill prevention and response and facility safety. This project will have a measurable impact on the port and its approaches including the recommended TAPS tanker routes, Santa Barbara Channel and within the harbor itself. While many of these ships currently call in San Pedro Bay, they normally do so on their ballast voyage back to Valdez.

Regarding the safe movement of these tankers, the DEIR should at a minimum cover:

1. Impact on and increased risk to ship traffic in the Santa Barbara Channel and its westward approaches.

2. Procedures and criteria for handling large tankers in the POLA. This discussion should include such items as minimum underkeel clearance, visibility limitations/criteria, use of pilots, requirements and availability of tug assistance, etc.

3. Use of the marine Exchange VTIS by the tankers and other ship traffic in the harbor.

4. Impact of the marine terminal on available anchorage grounds and on the ability of ships to rapidly exit the harbor in case of national emergency.

5. New aids to navigation required or desirable to assist in transit through the deep water channel and docking.

Under the general category of marine environmental protection and response, the following should be covered.

1. Waste Reception Facilities. The terminal will be required to meet the new regulations forthcoming to ensure compliance with MARPOL 73/78.

2. Oil Spill Prevention. The facility and vessels will be required to comply with pollution prevention regulations contained in 33 CFR 154, 155, 156 and 157. These regulations deal with the marine terminal cargo transfer operations and vessel characteristics and requirements.

3. Oil Spill Risk/Threat. The threat of spills and harm to the environment due to oil spills should be addressed. This should include transportation related spills and cargo transfer incidents and should cover the area from Point Conception to the terminal.

4. Oil Spill Response. Measures to mitigate the impact of spills should be addressed. These could include such things as booming the ships at berth, terminal membership in Clean Coastal Waters oil spill cooperative and tanker operators membership in the California oil spill cooperatives.

Under the category of general system safety there should be discussions of:

1. Fire/explosion threat/impacts and mitigations

2. Facility safety mitigations

I appreciate the opportunity to participate in this scoping process. If you have questions you may contact me or CDR ONSTAD on my staff.

Sincerely,

EDWARD V. GRACE
Captain, U.S. Coast Guard
Chief, Marine Safety Division
By direction of the District Commander

6.4 REFERENCES

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APPENDIXES

APPENDIX A

AIR QUALITY DATA, STANDARDS, AND METHODOLOGY

A.1 CONSTRUCTION EMISSIONS

A.1.1 EMISSION FACTORS FOR FUEL USAGE

The factors for calculating emissions from heavy-duty construction equipment in California and other states are listed in Tables A-1 and A-2.

Table A-1 - California: Emission Factors for Heavy Duty Construction Equipment Emissions Exhaust

	Emission ($lb/10^3$ gal)				
Activity	CO	ROG	NO_x	SO_2	Part.
Gasoline fuel usage	900[a]	76	52	5	16
Diesel fuel usage	102	37.5	281	7	33.5

[a]Average of carbon monoxide emission factors for heavy-duty diesel-powered construction equipment, Table 3.2.7-1 (EPA, 1977).
Source: EPA, SCAQMD 1985 for 0.05 wt percent fuel.

Table A-2 - Arizona, New Mexico, Texas: Emission Factors for Heavy Duty Construction Equipment Emissions Exhaust

	Emission ($lb/10^3$ gal)				
Activity	CO	ROG	NO_x	SO_2	Part.
Gasoline fuel usage	900[a]	76	52	5	16
Diesel fuel usage	102	37.5	281	27	33.5

[a]Average of carbon monoxide emission factors for heavy-duty, diesel-powered equipment, Table 3.2.7-1 (EPA, 1977).
Source: EPA, 1977; Marlia, 1985.

A.1.2 MOBILE CONSTRUCTION EMISSIONS

The emissions inventory for much of the construction phase in California was supplied by Pactex (Pactex, 1983). These values were developed in response to a South Coast Air Quality Management District (SCAQMD) request for construction emission estimates for the California portions of the pipeline. Tables A-3 through A-13 (placed at the end of this Appendix) contain specific assumptions and data regarding: equipment types; engine sizes and usage; construction emission sizes, usage, and types; tanker fuel oil requirements; emission factors used to calculate both worst case, 24-hour, and annual average emissions; and tanker usage rates during hoteling, offloading, and idling operations.

The Blythe-to-Midland construction emissions were assumed to be emitted at the same amount per mile as the Beaumont-to-Blythe section. The Beaumont-to-Blythe section is approximately 145 miles long, whereas the Blythe-to-Midland section is approximately 802 miles long. Thus, the Beaumont-to-Blythe emissions were multiplied by 802/145 to yield the Blythe-to-Midland emissions. Each of the pump stations was assumed to have identical construction emissions. For example, the Blythe-to-Midland CO emissions calculation is presented below. From Table A-10, the total CO construction emissions for the Beaumont-to-Blythe section is 242,280 lb. From Table A-8, the total CO construction emissions for one pump station is 3,111 lb. Therefore, the Blythe-to-Midland total CO construction emissions would be:

$$242{,}280 \text{ lb} \times \frac{802}{145} + 8 \text{ pump stations} \times \frac{3{,}111 \text{ lb}}{\text{pump station}}$$

$$= 1{,}364{,}947 \text{ lb (this value is shown in subsection A-3)}$$

A.1.3 FUGITIVE DUST CALCULATIONS

(1) POLA Tank Farm

Assume: 115-acre distributed area
90-day duration
1.2 tons per acre per month (EPA, 1977) (EPA, 1977: AP-42, section 11.2)
50% control efficiency (EPA, 1977)

$$115 \text{ acres} \times \frac{1.2 \text{ tons}}{\text{acre-month}} \times 3 \text{ months} \times 2{,}000 \frac{\text{lb}}{\text{ton}} \times 50\%$$

$$= 414{,}000 \text{ lb}$$
$$= 207.0 \text{ tons}$$

(2) Midland Tank Farm

Assume: 100 acres
90-day duration

$$100 \text{ acres} \times \frac{1.2 \text{ tons}}{\text{acre} \times \text{month}} \times 3 \text{ months} \times \frac{2{,}000 \text{ lb}}{\text{ton}} \times 50\%$$

= 360,000 lb
= 180 tons

(3) Pipeline Route

Assume: Length: see below
Width: 100 ft
90-day duration
1.2 tons per acre-month (43,560 ft^2 = 1 acre)
50% control efficiency

The results are:

Section	Assumed Length (mile)	Fugitive Dust (lb)
POLA to Los Angeles River	3	130,911
Los Angeles River to Walnut	30	1,309,107
Walnut to Beaumont	50	2,181,845
Beaumont to Blythe	145	6,327,350
Blythe to Midland	802	34,996,788

A.2 OPERATIONAL EMISSIONS

The operational emissions for the POLA area were developed by the SCAQMD (SCAQMD, 1984b) in review of the Pactex application for a Permit to Construct and Operate. Additional emission calculations were performed by ES and are presented in the following subsections.

A.2.1 MIDLAND TERMINAL STORAGE TANK EMISSIONS

Operational emissions for the Midland terminal storage tanks are presented below:

Standing Storage Loss (EPA, 1977: AP-42, section 4.3.2.3)

$$L_S = K_S V^n P^* D M_v K_c E_f$$

where,

L_S = standing storage emissions losses (lb/yr)
K_S = seal factor (0.7)
n = wind speed exponent (0.4)
v = average wind velocity (10.9 mph)
P^* = vapor pressure function (0.332)
D = tank diameter (240 ft/130 ft)
M_v = vapor molecular weight (50)
K_c = product factor (0.4)
E_f = secondary seal factor (1.0)

For eight 500,000-barrel tanks (240-ft diameter), the calculation yields

Ls = 23,200 lb/yr.

For three 72,000-barrel tanks,

Ls = 4,713 lb/yr

Withdrawal Loss (EPA, 1977: AP-42, section 4.3.2.3)

$$L_W = \frac{(0.943)\ QCW_L}{D}$$

where,

L_W = withdrawal loss (lb/yr)
Q = average throughput (bbl/yr)
C = clingage factor (0.0060)
W_L = density of liquid stock (7.41 lb/gal)
D = diameter

This calculation yields 39,776 lb/yr for the eight 500,000-barrel tanks and 11,896 lb/yr for the three 72,000-barrel tanks. The total operating loss from the 11 storage tanks is:

Standing Storage Loss =	23,200
Standing Storage Loss =	4,713
Withdrawal Loss =	39,776
Withdrawal Loss =	11,896
	79,585 lb/yr (or 218 lb/day)

A.2.2 POLA TERMINAL STORAGE TANK EMISSIONS

Operational emissions for the POLA terminal storage tanks are presented below:

Standing Storage Loss (EPA, 1977: AP-42, section 4.3.2.3)

$$L_s = K_s v^n P^* D M_v K_c E_f$$

where,

L_s = standing storage emissions losses (lb/yr)
K_s = seal factor (0.7)
n = wind speed exponent (0.4)
v = average wind velocity (6.8 mph)
P^* = vapor pressure function (0.332)
D = tank diameter (342 ft/210 ft/278 ft)
M_v = vapor molecular weight (50)
K_c = product factor (0.4)
E_f = secondary seal factor (1.0)

For four 342-ft-diameter tanks, the calculation yields

Ls = 3,442 lb/yr

For two 210-ft-diameter tanks,

Ls = 2,101 lb/yr

For two 278-ft-diameter tanks,

Ls = 2,782 lb/yr

Withdrawal Loss (EPA, 1977: AP-42, section 4.3.2.3)

$$L_w = \frac{(0.943)\ QCW_L}{D}$$

where,

L_w = withdrawal loss (lb/yr)
Q = average throughput (bbl/yr)
C = clingage factor (0.0060)
W_L = density of liquid stock (7.41 lb/gal)
D = diameter

This calculation yields 6,819, 4,187, and 5,542 lb/yr for the four 342-ft-, two 210-ft-, and two 278-ft-diameter tanks, respectively.

Therefore, the total POLA storage tank losses are equal to 70,268 lb/yr (or 192.5 lb/day).

A.2.3 EMPLOYEE VEHICLE EMISSIONS AT POLA

Assuming 48 employees (Pactex, 1983) each driving 25 round-trip miles per day, this equals 1,200 vehicle miles per day. Assuming an average commute speed of 30 mph, the following emission factors were used:

Pollutant	Emission Factor (g/mi)
CO	15.65
ROG	1.21
NO_x	2.08
SO_2	0.24
Part.	0.34

Source: SCAQMD, 1983.

This results in the following emission estimates:

Pollutant	Emissions (lb/day)
CO	41.4
ROG	3.2
NO_x	9.2
SO_2	0.6
Part.	0.9

A.2.4 AVERAGE DAILY POTENTIAL TANKER EMISSIONS

The methodology used in estimating average daily tanker emissions is described in subsection 4.2.1; worst-case potential tanker emissions are also contained in that subsection. Table A-9 presents the tanker emission factors. Table A-10 presents the average visit and annual fuel consumption, and Table A-11 presents the average daily potential tanker emissions. (Tables are placed at the end of this appendix.)

A.3 CALCULATION OF CONSTRUCTION EMISSION RATES FOR DISPERSION MODELING

For modeling purposes, construction emissions were assumed to be distributed over a 5,000- by 100-ft rectangular area.

The Beaumont-to-Blythe section represents a typical construction spread. First, emission quantities for each pollutant were calculated as shown in the example calculation in subsection A.1.1. Assuming that it takes 1 year (2,340 hours) to complete, the mobile construction emission rates were calculated as follows:

$$CO = 242{,}280 \text{ lb}/2{,}340 \text{ hr} \times \frac{0.126 \text{ g/s}}{\text{lb/hr}} = 13.0 \text{ g/s}$$

$$HC = 38{,}352 \text{ lb}/2{,}340 \text{ hr} \times \frac{0.126 \text{ g/s}}{\text{lb/hr}} = 2.1 \text{ g/s}$$

$$NO_x = 239{,}121 \text{ lb}/2{,}340 \text{ hr} \times \frac{0.126 \text{ g/s}}{\text{lb/hr}} = 12.9 \text{ g/s}$$

$$SO_2 = 17{,}717 \text{ lb}/2{,}340 \text{ hr} \times \frac{0.126 \text{ g/s}}{1\text{b/hr}} = 0.95 \text{ g/s}$$

$$\text{Particulates} = 11{,}324 \text{ lb}/2{,}340 \text{ hr} \times \frac{0.126 \text{ g/s}}{1\text{b/hr}} = 0.69 \text{ g/s}$$

The fugitive dust emission rate was calculated for the 5,000-ft stretch as follows:

$$5{,}000 \text{ ft} \times 100 \text{ ft} \times \frac{1 \text{ acre}}{43{,}560 \text{ ft}^2} = 11.5 \text{ acres}$$

$$11.5 \text{ acres} \times \frac{1.2 \text{ tons}}{\text{acre} \times \text{mo}} \times 50\% \times 3 \text{ months} = 41{,}322 \text{ lb}$$

Assuming 195 hours per month, this yields an emission rate of 71 lb/hr or 8.9 g/s. Summing the fugitive dust with the mobile particulate emissions yields a particulate emission rate of 9.5 g/s. These emission rates were then modeled as described in subsection 4.2.1.

A.4 SCAQMD OFFSET FACTORS

(1) For emissions reductions at another stationary source:

Offset factor = 1.1 + b(x)

where,

x = the distance in kilometers between the affected source permit unit and the offset permit unit

b = 0, when x is less than 8 km (5 mi)

b = 0.01, when x is equal to or greater than 8 km (5 mi)

The calculated offset factor shall not exceed 1.5.

(2) For emission reductions from mobile sources that are not used exclusively on the premises of the subject stationary source, the offset factor shall be 1.5.

A.5 DESCRIPTION OF PROPOSED INNOVATIVE CONTROL MEASURES

Each berth would be serviced with a machine that draws the flue gas from the tanker's stack and passes the flue gas through the emission control equipment (ECE). Two ECE trains would be required, one for each berth. The critical design item is the system that draws the flue gas from the tanker's stack. Each tanker has its stack in a different position relative to the ECE. The tanker's stack would not necessarily be cylindrical. Also, the elevation of the stack, relative to the ECE, would vary with the tide and amount of oil offloaded. The system's design incorporates various features that would permit the matching of ECE duct to the tanker's stack and the variation of elevation during offloading. The system would consist of a tower crane

(similar to the common construction crane) mounted on a mobile bed. The crane would run along tracks to the required position to match the tanker's stack. The flue gas duct would be part of the tower crane's structure. A jib would extend from the crane, which positions the telescoping duct and fabric sock over the stack. The corrosion-resistant fabric sock extending from the duct would be fastened securely to the tanker's stack. Sensors would be placed on the crane's duct to sense both the tanker's movement and the signal fed to a computer control center, which would automatically position the duct relative to the tanker.

The duct leading from the crane, which runs from the stack and along the crane's structural steel, would connect to the ECE duct that runs under the crane. A quick disconnect would be used to secure the ECE's duct to the crane's duct. Two fans, one before and the other after the ECE train, would be used to draw the tanker's flue gas through the ECE train.

Carbon monoxide and oxygen would be monitored in the duct between the tanker's stack and ECE to ensure proper firing of the tanker's boiler. The ECE consists of the following equipment: forced and induced draft fans, electrostatic precipitator (ESP), combustion chamber, NO_x converter, heat recovery equipment, scrubber and flue gas reheat system, stack, and the ancillary equipment such as the propane and ammonia systems.

The 250°F to 350°F flue gas from the stack is drawn by the forced draft fan and blown through the ESP, which removes 70% of the particulate matter. The flue gas discharging from the ESP enters a gas-to-gas heat exchanger where it is heated to 450°F before it is fed to the combustion chamber. In the combustion chamber, the flue gas is heated to 700°F, and subsequently mixed with trace quantities of ammonia, before entering the NO_x converter. The ammonia reacts with NO_x to form nitrogen and water as it passes over the catalyst contained in the converter; 90% of all the NO_x converts to nitrogen. Heat is recovered from the gas exiting the converter by passing it through three heat exchangers: ECE inlet flue gas, combustion air heater, and scrubber flue gas reheater. The heat recovery system minimizes the use of propane in the combustion chamber.

The flue gas exits the last heat exchanger (scrubber flue gas reheater), just before the seawater scrubber, at 350°F. The flue gas enters the scrubber where it passes through three sieve trays flooded with seawater. The seawater enters at the top of the scrubber, flows across the tray, cascades to the tray below, and finally drains back into the ocean. Seawater is naturally alkaline and reacts with 90% of the SO_2 in the flue gas. The quantity of seawater is so large and the SO_2 so low that only a trace effect on the seawater is returned to the ocean. The seawater temperature increases from 70°F to approximately 73°F in the scrubber. The dilution effect of the ocean attenuates this small temperature rise.

The flue gas leaving the scrubber is at 100°F. The gas is reheated to 250°F as it passes through the scrubber reheater before it is drawn through the induced draft fan and is discharged to the atmosphere via a 60-ft stack.

Table A-3 - Offshore Civil Construction - Construction Emissions (18-month duration)

Unit Description	Horsepower per Unit		Units	Days Reqd on	Use	Total	Fuel (gal/unit/workday)		Total Fuel (gal)		Total Emissions (lb)				
	Gas	Diesel	(No.)	Project	(%)	Workday	Gas	Diesel	Gas	Diesel	CO	HC	NO_x	SO_2	Part.
Dredging (24 hr/day)															
Dredge, suction (electric)	-	-	1	60	65	39	-	-	-	-	-	-	-	-	-
Anchor skow	-	250	2	60	30	36	-	225	-	8,100	771	300	2,997	219	105
Tugboat	-	1,000	2	60	30	36	-	900	-	32,400	3,086	1,199	11,988	875	421
Launch, survey	-	150	1	60	30	18	-	100	-	1,800	171	67	666	49	23
Dike (24 hr/day)															
Barge, crane w/tug (hauling and placing rock)	-	2,700	2	90	20	36	-	2,000	-	72,000	6,857	2,664	26,640	1,944	936
Launch, survey	-	150	1	90	30	27	-	100	-	2,700	257	100	999	73	35
Piling (9 hr/day)															
Pile hammer, diesel	-	100	2	300	40	240	-	30	-	7,200	686	266	2,664	194	94
Barge, crane 60-ton	-	200	4	300	30	360	-	70	-	25,200	2,400	932	9,324	680	328
Supply barge	-	-	4	300	30	360	-	-	-	-	-	-	-	-	-
Tugboat	-	500	2	300	50	300	-	150	-	45,000	4,286	1,665	16,650	1,215	585
Launch	-	150	1	300	50	150	-	40	-	6,000	571	222	2,220	162	78
Pile Capping (9 hr/day)															
Barge, crane, 20-ton, seahorse	-	350	1	260	50	130	-	110	-	14,300	1,362	529	5,291	386	186
Barge, crane, 20-ton, seahorse	-	350	1	130	50	65	-	110	-	7,150	681	265	2,646	193	93
Barge, supply w/tug	-	500	4	150	30	180	-	300	-	54,000	5,143	1,998	19,980	1,458	702
Pile Preparation (shore)(9 hr/day)															
Crane, 60-ton	-	200	1	300	40	120	-	70	-	8,400	800	311	3,108	227	109
Truck, welding and utilities	-	175	2	180	30	108	-	45	-	4,800	463	180	1,798	131	63
Concrete Decks and Roadway															
Barge, crane 50-ton	-	350	1	180	70	126	-	110	-	13,860	1,320	513	5,128	374	180
Supply barge	-	-	2	180	30	108	-	-	-	-	-	-	-	-	-
Tugboat	-	500	2	180	30	108	-	300	-	32,400	3,086	1,199	11,988	875	421

Source: Pactex, 1983b.

Table A-4 - Berth and Metering Facilities - Construction Emissions (15-month duration)

Unit Description	Horsepower per Unit		Units	Days Reqd on	Use	Total	Fuel (gal/unit/workday)		Total Fuel (gal)		Total Emissions (lb)				
	Gas	Diesel	(No.)	Project	(%)	Workday	Gas	Diesel	Gas	Diesel	CO	HC	NO_x	SO_2	Part.
Civil (Onshore)															
Concrete saw	10	-	2	20	70	28	10	-	280	-	252	21	15	1	4
Pavement breaker	-	70	1	20	70	14	-	25	-	350	33	13	130	9	5
Front-end loader	-	155	1	50	50	25	-	40	-	1,000	95	37	370	27	13
Dump truck, 10 yd^3	-	220	6	18	70	76	-	54	-	4,104	391	152	1,518	111	53
Backhoe, 225	-	135	1	30	60	18	-	54	-	972	93	36	360	26	13
Bulldozer, D-7	-	200	1	30	40	12	-	68	-	816	78	30	302	22	11
Compactor, 826B	-	300	1	30	60	18	-	90	-	1,620	154	60	599	44	21
Grader, No. 14	-	180	1	30	60	18	-	72	-	1,296	123	48	480	35	17
Air compressor, 600 ft^3/min	-	250	1	30	60	18	-	54	-	972	93	36	360	26	13
Truck tractor, 6,000-gal water	-	345	1	30	40	12	-	72	-	864	82	32	320	23	11
Compactor, handheld	4	-	4	30	60	72	10	-	720	-	648	55	37	4	12
Mechanical															
Sideboom, 583	-	300	1	220	60	132	-	90	-	11,880	1,131	440	4,396	321	154
Truck crane, 20-ton	-	200	2	220	40	176	-	54	-	9,504	905	352	3,516	257	124
Truck crane, 15-ton	-	200	2	220	40	176	-	45	-	7,920	754	293	2,930	214	103
Truck, 4-ton, winch, A-frame	-	210	1	220	30	66	-	54	-	3,564	339	132	1,319	96	46
Air compressor, 900 ft^3/min	-	280	1	220	20	44	-	65	-	2,860	272	106	1,058	77	37
Air compressor, 150 ft^3/min	-	45	2	220	40	176	-	20	-	3,520	335	130	1,302	95	46
Pump, 8-in.	-	70	2	220	20	88	-	35	-	3,080	293	114	1,140	83	40
Truck, pressure pump	-	200	1	220	20	44	-	45	-	1,980	189	73	733	53	26
Electric welder	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Buffing rig	-	45	1	220	50	110	-	20	-	2,200	210	81	814	59	29
Sideboom, 572	-	200	1	220	60	132	-	68	-	8,976	855	332	3,321	242	117
General															
String truck, trailer	-	200	2	50	60	60	-	54	-	3,240	309	120	1,199	87	42
Truck, flatbed, 5-ton	-	210	1	240	30	72	-	54	-	3,888	370	144	1,439	105	51
Truck, flatbed, 2-ton	-	175	2	250	25	125	-	54	-	6,750	643	250	2,498	182	88
Truck, grease	-	175	1	250	20	50	-	54	-	2,700	257	100	999	73	35
Truck, fuel, 3,000-gal tank	-	150	1	250	20	50	-	50	-	2,500	238	93	925	68	33
Truck, carryall	-	175	2	260	30	156	-	54	-	8,424	802	312	3,117	227	110
Crane, 60-ton - shore	-	350	1	180	40	72	-	110	-	7,920	754	293	2,930	214	103
Barge, crane 60-ton	-	350	1	180	30	54	-	110	-	5,940	566	220	2,198	160	77
Tugboat	-	500	1	180	25	45	-	225	-	10,125	964	375	3,746	273	132

Source: Pactex, 1983b.

Table A-5 - Pipeline Section 1 - Berths to Carson to Los Angeles River - Construction Emissions (19-month duration)

Unit Description	Horsepower per Unit		Units	Days Reqd on	Use	Total	Fuel (gal/unit/workday)		Total Fuel (gal)		Total Emissions (lb)				
	Gas	Diesel	(No.)	Project	(%)	Workday	Gas	Diesel	Gas	Diesel	CO	HC	NO_x	SO_2	Part.
Cut/Remove Paving															
Concrete saw	10	-	2	190	75	285	9	-	2,565	-	2,309	195	133	13	41
Pavement breaker	-	70	1	190	75	143	-	23	-	3,289	313	122	1,217	89	43
Front-end loader	-	155	1	65	80	52	-	41	-	2,132	203	79	789	58	28
Dump truck, 10 yd^3	-	220	3	65	75	146	-	54	-	7,884	751	292	2,917	213	102
Utilities Location															
Tractor w/hoe and blade	-	55	1	265	50	133	-	36	-	4,788	456	177	1,772	129	62
Air compressor, 150 ft^3/min	-	45	1	265	30	80	-	18	-	1,440	137	53	533	39	19
Truck, flatbed, 2-ton	-	175	1	265	15	40	-	72	-	2,880	274	107	1,066	78	37
Ditch															
Backhoe, CAT. 235	-	195	2	340	70	476	-	75	-	3,570	340	132	1,321	96	46
Clam, dragline	-	162	1	115	60	69	-	54	-	3,726	355	138	1,379	101	48
Gradeall, 1/2 yd^3	-	90	1	340	60	204	-	45	-	9,180	874	340	3,397	248	119
Front-end loader	-	155	1	220	60	132	-	41	-	5,412	515	200	2,002	146	70
Bulldozer, D-7	-	200	1	265	50	133	-	75	-	9,975	950	369	3,691	269	130
Dump truck, 10 yd^3	-	220	10	220	70	1,540	-	54	-	8,316	792	308	3,077	225	108
Shore Ditch															
Truck crane, 15-ton	-	175	1	340	70	238	-	54	-	12,852	1,224	476	4,755	347	167
Truck, flatbed, 2-1/2-ton	-	175	2	340	40	272	-	72	-	19,584	1,865	725	7,246	529	255
Air compressor, 150-ft^3/min	-	45	1	340	50	170	-	18	-	3,060	241	113	1,132	83	40
Chain saw	3	-	2	340	10	68	1	-	60	-	54	5	3	1	1
Haul Pipe to Ditch															
String truck and trailer	-	200	1	295	40	118	-	68	-	8,024	764	297	2,969	217	104
Truck crane, 20-ton	-	200	1	295	15	44	-	54	-	2,376	226	88	879	64	31
Lay, Weld, and Tie In															
Quad Arc Welder, D-6	-	140	1	350	60	210	-	50	-	10,500	1,000	389	3,885	284	137
Truck, utility w/300A welder	-	165	2	350	60	420	-	36	-	15,120	1,440	559	5,594	408	192
Sideboom, 583	-	300	2	350	70	490	-	70	-	34,300	3,267	1,269	12,691	926	446
Truck crane, 20-ton	-	200	1	350	50	175	-	54	-	9,450	900	350	3,497	255	123
Truck, 2-ton	-	175	1	350	30	105	-	50	-	5,250	500	194	1,943	142	68
Air compressor, 150 ft^3/min	-	45	1	350	40	140	-	18	-	2,520	240	93	932	68	33
Coat Joints and Fittings															
Buffing rig	-	45	1	350	50	175	-	23	-	4,025	383	149	1,489	109	52

Table A-5 (Contd)

Unit Description	Horsepower per Unit Gas	Horsepower per Unit Diesel	Units (No.)	Days Reqd on Project	Use (%)	Total Workday	Fuel (gal/unit/workday) Gas	Fuel (gal/unit/workday) Diesel	Total Fuel (gal) Gas	Total Fuel (gal) Diesel	Total Emissions (lb) CO	HC	NO_x	SO_2	Part.
Road, Rail Boring															
Truck crane, 20-ton	-	200	1	220	30	66	-	54	-	3,564	339	132	1,319	96	46
Boring machine, 56-in.	-	75	1	220	70	154	-	36	-	5,544	528	205	2,051	150	72
Truck, flatbed w/winch	-	170	1	220	30	66	-	36	-	2,376	226	88	879	64	31
Truck, utility w/300A welder	-	165	1	220	20	44	-	40	-	-	-	-	-	-	-
Backfill and Tamp															
Front-end loader	-	155	1	350	70	245	-	41	-	10,045	957	372	3,717	271	131
Gradeall, 1/2 yd^3	-	90	1	350	65	228	-	45	-	10,260	977	380	3,796	277	133
Clam, dragline, 3/4 yd^3	-	162	1	350	50	175	-	54	-	9,450	900	350	3,497	255	123
Air compressor, 365 ft^3/min	-	130	2	350	80	560	-	45	-	25,200	2,400	932	9,324	680	328
Motor grader, No. 12	-	130	1	350	60	210	-	50	-	10,500	1,000	389	3,885	284	137
Compactor, handheld	4	-	10	350	80	2,800	9	-	25,200	-	22,680	1,915	1,310	126	403
Fabrication															
Truck crane, 20-ton	-	200	1	295	20	59	-	54	-	3,186	303	118	1,179	86	41
Truck, flatbed, 4 ton w/winch	-	210	1	295	20	59	-	81	-	4,779	455	177	1,768	129	62
Air compressor, 150-ft^3/min	-	45	1	295	15	44	-	18	-	792	75	29	293	21	10
Truck, utility, 1-ton	-	165	1	295	15	44	-	41	-	1,804	172	67	667	49	23
Testing															
Pump, 6-in. fill	-	50	2	280	30	168	-	27	-	4,536	432	168	1,678	122	59
Pump, 8-in. centrifugal	-	90	1	280	30	84	-	36	-	3,024	288	112	1,119	82	39
Pressure pump and truck	-	200	1	280	10	28	-	32	-	896	85	33	332	24	12
Truck, 2-ton	-	175	1	280	10	28	-	50	-	1,400	133	52	518	38	18
Bending															
Bending maching, 48-in.	-	150	1	340	30	102	-	23	-	2,346	-	-	-	-	-
Sideboom, 572-G	-	200	1	340	30	102	-	45	-	4,590	437	170	1,698	124	60
Air compressor, 150-ft^3/min	-	45	1	340	15	51	-	18	-	918	87	34	340	25	12
Cleanup															
Bulldozer, D-7	-	200	1	295	50	148	-	68	-	10,064	958	372	3,724	272	131
Front-end loader	-	155	1	295	60	177	-	41	-	7,257	691	269	2,685	196	94
Motor grader, No. 12	-	130	1	295	60	177	-	50	-	8,850	843	327	3,275	239	115
Dump truck, 6 yd^3	-	190	4	295	60	708	-	45	-	31,860	3,034	1,179	11,788	860	414
Gradeall, 1/2 yd^3	-	90	1	295	50	148	-	45	-	6,668	634	246	2,464	180	87
Truck, 2-ton	-	175	1	295	40	118	-	50	-	5,900	562	218	2,183	159	77

Source: Pactex, 1983b.

Table A-6 - Carson Terminal - Construction Emissions (26-month duration)

Unit Description	Horsepower per Unit		Units	Days Reqd on	Use	Total	Fuel (gal/unit/workday)		Total Fuel (gal)		Total Emissions (lb)				
	Gas	Diesel	(No.)	Project	(%)	Workday	Gas	Diesel	Gas	Diesel	CO	HC	NO_x	SO_2	Part.
Civil															
Bulldozer, D-8	-	300	3	90	70	189	-	90	-	17,010	1,620	629	6,294	459	221
Backhoe, 235	-	195	4	90	65	234	-	90	-	21,060	2,006	779	7,792	569	274
Backhoe, blade	-	60	4	90	60	216	-	27	-	5,832	555	216	2,158	157	76
Front-end loader, 980	-	260	2	90	70	126	-	90	-	11,340	1,080	420	4,196	306	147
Compactor, 826E	-	300	2	60	70	84	-	117	-	9,828	936	364	3,636	265	128
Scraper, DW-21G	-	345	4	60	70	168	-	101	-	16,968	1,616	628	6,278	458	221
Motor grader, No. 14	-	180	2	70	70	126	-	72	-	9,072	864	336	3,357	245	118
Bulldozer, D-1	-	200	2	90	70	126	-	68	-	8,568	816	317	3,170	231	111
Dump truck, 10 yd^3	-	220	10	60	70	420	-	54	-	22,680	2,160	839	8,392	612	295
Air compressor, 600 ft^3/min	-	220	2	60	50	60	-	54	-	3,240	309	120	1,199	87	42
Vibrator compactor roller	-	270	2	60	90	84	-	90	-	7,560	720	280	2,797	204	98
Tractor, 6,000-gal water tank	-	345	2	60	70	84	-	72	-	6,048	576	224	2,238	163	79
Air compressor, 365-ft^3/min	-	130	4	60	60	144	-	450	-	6,480	617	240	2,398	175	84
Pavement breaker	-	70	1	60	70	42	-	20	-	840	80	31	311	23	11
Mechanical															
Sideboom, 583	-	300	2	150	60	180	-	90	-	12,960	1,234	479	4,795	350	169
Sideboom, 572	-	200	2	150	60	180	-	68	-	9,792	933	362	3,623	264	127
Crane, 30-ton	-	250	2	190	40	152	-	72	-	8,755	834	324	3,239	236	114
Crane, 20-ton	-	200	3	160	30	144	-	54	-	6,220	593	230	2,302	168	81
Truck, 4-ton, winch, A-frame	-	210	1	210	40	84	-	81	-	5,443	518	202	2,014	147	70
Air compressor, 900 ft^3/min	-	280	1	160	20	32	-	63	-	2,016	192	75	746	54	26
Air compressor, 150 ft^3/min	-	45	4	200	60	480	-	18	-	8,640	823	320	3,197	233	112
Pump, 6-in.	50	-	2	120	20	48	27	-	1,296	-	1,166	98	67	6	21
Pump, 10-in.	-	100	2	120	20	48	-	45	-	2,160	206	80	799	58	28
Pressure pump, truck	-	200	1	120	20	48	-	32	-	1,536	146	57	568	41	20
Electric welders	-	-	15	-	-	-	-	-	-	-	-	-	-	-	-
Buffing rig	-	45	2	200	50	200	-	25	-	5,000	476	185	1,850	135	65
Retaining Wall															
Backhoe, 5/8-yd^3	-	108	2	50	55	55	-	63	-	3,465	330	128	1,282	94	45
Flatbed truck, 2-ton	175	-	2	60	35	42	72	-	3,024	-	2,722	230	157	15	48
Air compressor, 250-ft^3/min	-	90	4	110	60	264	-	45	-	11,880	1,131	440	4,396	321	154
Truck, 20-ton float	-	200	2	110	30	66	-	67	-	4,422	421	164	1,636	119	57
Truck, 10-ton crane	-	180	4	140	50	280	-	54	-	15,120	1,440	559	5,594	408	197
Dump truck	-	220	4	75	70	210	-	54	-	11,340	1,080	420	4,196	306	147
Front-end loader	-	155	2	100	70	140	-	40	-	5,600	533	207	2,072	151	73

Source: Pactex, 1983b.

Table A-7 - Pipeline Section 2 - Los Angeles River to Walnut - Construction Emissions (25-month duration)

Unit Description	Horsepower per Unit		Units	Days Reqd on	Use	Total	Fuel (gal/unit/workday)		Total Fuel (gal)		Total Emissions (lb)				
	Gas	Diesel	(No.)	Project	(%)	Workday	Gas	Diesel	Gas	Diesel	CO	HC	NO_x	SO_2	Part.
Utilities Location															
Tractor	-	55	1	345	50	173	-	36	-	6,228	593	230	2,304	168	81
Air compressor, 150-ft3/min	-	45	1	345	30	104	-	18	-	1,872	178	69	692	51	24
Truck, flatbed, 2-ton	175	-	1	305	15	57	72	-	4,104	-	3,694	312	213	21	66
Ditch															
Backhoe	-	135	2	310	70	434	-	36	-	15,624	1,488	578	5,781	422	203
Clam, Dragline 3/4-yd^3	-	162	1	75	60	45	-	54	-	2,430	231	90	899	66	32
Gradeall, 1/2-yd^3	-	90	1	230	60	138	-	45	-	6,210	591	230	2,298	168	81
Trench machine	-	165	1	230	70	138	-	63	-	8,694	828	322	3,217	235	113
Air compressor, 150 ft^3/min	-	45	1	155	30	47	-	18	-	846	81	31	313	22	11
Front-end loader	-	155	1	270	60	162	-	41	-	6,480	633	246	2,458	179	86
Bulldozer, D-7	-	200	1	215	50	108	-	60	-	6,642	617	240	2,390	175	84
Dump truck, 10-yd^3	-	220	4	215	70	602	-	54	-	32,508	3,096	1,203	12,028	878	423
Shore Ditch															
Truck crane, 15-ton	-	175	1	370	70	259	-	54	-	13,586	1,332	517	5,175	378	182
Truck, flatbed, 2-1/2-ton	-	175	2	370	20	148	-	72	-	10,656	1,015	394	3,943	288	139
Air compressor, 150-ft^3/min	-	45	1	370	30	111	-	18	-	1,998	190	74	739	54	26
Chain saw	3	-	2	370	10	74	2	-	148	-	133	11	8	1	2
Hack Pipe to Ditch															
String truck and trailer	-	200	2	230	50	230	-	68	-	15,640	1,490	579	5,787	422	203
Truck crane, 20-ton	-	200	1	230	15	35	-	68	-	2,380	227	88	881	64	31
Lay, Weld, and Tie-in															
Quad arc welder, D-6	-	140	1	370	60	222	-	50	-	11,100	1,059	411	4,107	300	144
Truck, utility w/300A welder	-	165	4	370	60	888	-	36	-	31,968	3,045	1,182	11,828	863	416
Sideboom 583	-	300	2	370	60	444	-	63	-	27,972	2,664	1,035	10,350	755	364
Truck, crane, 20-ton	-	200	1	370	40	148	-	54	-	7,992	761	296	2,957	216	104
Truck, flatbed, skid, 2-ton	-	175	2	370	30	222	-	72	-	15,984	1,522	591	5,914	432	208
Air compressor, 150 ft^3/min	-	45	1	370	30	111	-	18	-	1,988	190	74	734	54	26
Coat Joints and Fittings															
Buffing rig, R.T.	-	45	1	370	50	185	-	23	-	4,155	405	157	1,574	115	55

Table A-7 (Contd)

Unit Description	Horsepower per Unit		Units	Days Req'd on	Use	Total	Fuel (gal/unit/workday)		Total Fuel (gal)		Total Emissions (lb)				
	Gas	Diesel	(No.)	Project	(%)	Workday	Gas	Diesel	Gas	Diesel	CO	HC	NO_x	SO_2	Part.
Road and Rail Boring															
Truck crane, 20-ton	-	200	1	295	50	148	-	54	-	7,992	761	296	2,957	216	104
Boring machine, 48-in.	-	75	1	295	70	107	-	36	-	7,452	710	276	2,757	201	97
Truck, flatbed w/winch	-	170	1	295	20	60	-	36	-	2,160	206	80	794	58	28
Truck, utility w/300A welder	-	165	1	295	20	60	-	41	-	2,460	234	91	910	66	32
Fabrication															
Truck crane, 20-ton	-	200	1	310	20	62	-	54	-	3,248	319	124	1,234	40	44
Truck, flatbed w/winch	-	170	1	310	20	62	-	81	-	5,022	478	186	1,858	136	65
Air compressor, 150-ft^3/min	-	45	1	310	15	47	-	18	-	846	81	31	312	23	11
Truck, utility w/300A welder	-	165	2	310	60	372	-	41	-	15,252	1,453	564	5,643	412	198
Testing															
Pump, 6-in.	50	-	2	375	30	195	27	-	5,265	-	4,739	400	274	26	84
Pump, 8-in.	90	-	1	325	30	98	36	-	3,528	0	3,175	268	182	18	56
Pressure pump and truck	-	200	1	325	10	33	-	32	-	1,056	101	39	391	29	14
Truck, flatbed, 2-ton	-	175	1	325	10	33	-	72	-	2,376	226	88	879	64	21
Backfill and Tamp															
Front-end loader	-	155	1	370	70	259	-	41	-	10,219	1,011	393	3,929	287	138
Gradeall, 1/2-yd^3	-	90	1	370	65	241	-	45	-	10,845	1,032	401	4,012	293	141
Clam, dragline, 3/4-yd^3	-	162	1	370	40	148	-	54	-	7,992	741	296	2,457	216	104
Air compressor, 365-ft^3/min	-	130	2	370	80	592	-	45	-	26,640	2,537	986	9,857	719	346
Motor grader	-	130	1	370	40	148	-	50	-	7,400	705	274	2,738	200	96
Compactor, hand-held	4	-	6	370	80	1,776	9	-	15,984	-	14,386	1,215	831	80	256
Bulldozer, D-7	-	200	1	370	40	148	-	75	-	11,100	1,057	411	4,107	300	144
Bending															
Bending machine, 42-in	150	-	1	355	30	107	23	-	2,461	-	2,215	187	128	12	39
Sideboom, 5,726	-	200	1	355	30	107	-	45	-	4,815	459	178	1,782	130	63
Air compressor, 150-ft^3/min	-	45	1	355	15	54	-	18	-	972	93	36	360	26	13
Cleanup															
Bulldozer, D-7	-	200	1	370	40	148	-	68	-	10,024	958	372	3,744	272	131
Front-end loader, 950 R.T.	-	155	1	370	50	185	-	41	-	7,585	722	288	2,806	205	99
Motor grader	-	130	1	370	50	185	-	50	-	9,250	881	342	3,422	250	120
Dump truck, 6-yd^3	-	190	4	370	50	740	-	45	-	31,300	3,171	1,232	12,321	899	432
Gradeall, 1/2-yd^3	-	90	1	370	40	148	-	45	-	6,660	634	246	2,464	180	87
Truck, flatbed, 2-ton	-	175	1	370	40	148	-	72	-	10,656	1,015	394	3,543	288	139

Source: Pactex, 1983b.

Table A-8 - Rialto or Blythe Pump Station - Construction Emissions (6-month duration)

Unit Description	Horsepower per Unit		Units	Days Reqd on	Use	Total	Fuel (gal/unit/workday)		Total Fuel (gal)		Total Emissions (lb)				
	Gas	Diesel	(No.)	Project	(%)	Workday	Gas	Diesel	Gas	Diesel	CO	HC	NO_x	SO_2	Part.
Civil															
Bulldozer, D-7	-	200	1	30	70	21	-	68	-	1,428	136	53	528	39	19
Backhoe, 225	-	135	1	50	70	35	-	54	-	1,890	180	70	699	51	25
Backhoe	-	60	2	60	60	72	-	27	-	1,944	185	72	719	52	25
Front-end loader	-	155	1	60	60	36	-	40	-	1,440	137	53	533	39	19
Dump truck, 10-yd^3	-	220	2	10	70	14	-	54	-	756	72	28	280	20	10
Air compressor, 150-ft^3/min	-	45	1	50	40	20	-	20	-	400	38	15	148	11	5
Compactor, handheld	4	-	4	40	60	96	9	-	864	-	778	66	45	4	14
Motor grader	-	130	1	30	60	18	-	50	-	900	86	33	333	24	12
Mechanical															
Truck, crane, 20-ton	-	200	1	80	40	32	-	54	-	1,728	165	64	639	47	22
Sideboom, D-7	-	200	1	80	30	24	-	68	-	1,632	155	60	604	44	21
Truch, 4-ton, winch, A-frame	-	210	1	80	30	24	-	81	-	1,944	185	72	719	52	25
Air compressor, 900 ft^3/min	-	280	1	15	60	9	-	63	-	567	54	21	210	15	7
Pump, 4-in.	40	-	1	15	60	9	20	-	180	-	162	14	9	1	3
Pressure pump, truck	-	200	1	15	20	3	-	32	-	96	9	4	36	3	1
Truck, 3,000-gal water	-	150	1	10	30	3	-	27	-	81	8	3	30	2	1
General															
Truck tractor, 25-ton L.B.	-	200	1	120	30	36	-	54	-	1,944	185	72	719	52	25
Truck tractor, 20-ton float	-	200	1	120	40	48	-	54	-	2,592	247	96	959	70	34
Truck, flatbed	-	200	1	120	30	36	-	54	-	1,944	185	72	719	52	25
Truck, grease	-	200	1	120	10	12	-	54	-	648	62	24	240	17	8
Truck, fuel, 3,000-gal	-	150	1	120	15	18	-	30	-	540	51	20	200	15	7
String, truck w/trailer	-	200	2	4	60	6	-	54	-	324	31	12	120	9	4

Source: Pactex, 1983b.

Table A-9 - Walnut-to-Beaumont Pipeline - Construction Emissions (7-month duration)

Unit Description	Horsepower per Unit		Units	Days Reqd on	Use	Total	Fuel (gal/unit/workday)		Total Fuel (gal)		Total Emissions (lb)				
	Gas	Diesel	(No.)	Project	(%)	Workday	Gas	Diesel	Gas	Diesel	CO	HC	NO_x	SO_2	Part.
Right-of-Way Preparation															
Bulldozer, D-8	-	300	1	100	60	60	-	90	-	5,400	514	200	1,998	146	70
Bulldozer, D-7	-	200	2	100	60	120	-	68	-	8,160	777	302	3,019	220	106
Truck, flatbed, 2-ton	-	1,175	1	100	20	20	-	72	-	1,440	137	55	533	39	19
Haul and String Pipe															
Truck, crane, 20-ton	-	200	1	90	83	75	-	54	-	4,050	386	150	1,499	109	53
Sideboom, 572	-	200	1	90	80	72	-	68	-	4,896	466	181	1,812	132	64
Truck, trailer/pipe	-	200	14	90	83	1,046	-	68	-	71,128	6,774	2,632	26,317	1,920	925
Tow tractor, D-7	-	200	1	90	40	36	-	68	-	2,448	233	91	906	66	32
Ditch															
Backhoe, 225	-	135	4	108	80	346	-	54	-	18,684	1,779	691	6,913	504	243
Dragline, 3/4-yd^3, truck	-	162	1	108	50	54	-	54	-	2,916	278	108	1,079	79	38
Dozer/ripper, D-8	-	300	1	108	40	43	-	90	-	3,870	369	143	1,432	104	50
Trenching machine, 400	-	165	1	108	80	86	-	63	-	5,418	516	200	2,005	146	70
Tow tractor, D-7	-	200	1	108	30	32	-	68	-	2,176	207	81	805	59	28
Bending															
Bending machine, 42-in	-	150	1	105	30	32	-	23	-	736	70	27	272	28	10
Sideboom, 583	-	200	1	105	30	32	-	68	-	2,176	207	81	805	59	28
Air compressor, 150-ft^3/min	-	45	1	105	30	32	-	20	-	640	61	24	237	17	8
Pipe Gang															
Sideboom, 583	-	300	2	108	80	173	-	90	-	15,570	1,483	576	5,761	420	202
Quad arc welder, D-6	-	140	2	108	80	173	-	50	-	8,650	824	320	3,201	234	112
Air compressor, 150-ft^3/min	-	45	2	108	80	173	-	20	-	3,460	330	128	1,280	93	45
Skid truck, 2-1/2-ton	-	175	2	108	40	86	-	72	-	6,192	590	229	2,291	167	80
Fabrication															
Truck, crane, 20-ton	-	200	1	100	20	20	-	54	-	1,080	103	40	400	29	14
Truck, winch, A-frame	-	210	1	100	20	20	-	81	-	1,620	154	60	599	44	21
Air compressor, 150-ft^3/min	-	45	1	100	15	15	-	20	-	300	29	11	111	8	4
Truck, 300A welder	-	175	4	100	60	240	-	45	-	10,800	1,029	400	3,996	292	140
Truck, 1-ton utility	-	175	1	100	20	20	-	45	-	900	86	33	333	24	12
Fencing															
Farm tractor, auger	-	40	1	90	40	36	-	20	-	720	69	27	266	19	9
Truck, 1-ton utility trailer	-	165	1	90	30	27	-	40	-	1,080	103	40	400	29	14

Table A-9 (Contd)

Unit Description	Horsepower per Unit		Units (No.)	Days Reqd on Project	Use (%)	Total Workday	Fuel (gal/unit/workday)		Total Fuel (gal)		Total Emissions (lb)				
	Gas	Diesel					Gas	Diesel	Gas	Diesel	CO	HC	NO_x	SO_2	Part.
Revegetation															
Farm tractor attachments	-	60	1	60	60	36	-	27	-	972	93	36	360	26	13
Truck, spreader, fertilizer	-	175	1	60	30	18	-	72	-	1,296	123	48	480	35	17
Truck, 3,000-tank	-	150	1	60	30	18	-	40	-	720	69	27	266	19	9
Cleanup															
Bulldozer, D-7	-	200	1	90	40	36	-	68	-	2,448	233	91	906	66	32
Front-end loader	-	155	1	90	60	54	-	40	-	2,160	206	80	799	58	28
Motor grader, No. 12	-	130	1	90	50	45	-	50	-	2,250	214	83	833	61	29
Dump truck, 6-yd^3	-	190	4	90	50	180	-	45	-	8,100	771	300	2,997	219	105
Gradeall, 1/2-yd	-	90	1	90	50	45	-	45	-	2,025	193	75	749	55	26
Flatbed, truck, 2-ton	-	175	1	90	30	27	-	72	-	1,944	185	72	719	52	25
Testing															
Truck tractor, 40-ton L.B.	-	375	1	60	20	12	-	81	-	972	93	36	360	26	13
Pump, 10-in.	-	80	3	60	30	54	-	36	-	1,944	185	72	719	52	25
Truck, pressure pump	-	200	1	60	15	9	-	63	-	567	54	21	210	15	7
Truck, 4-ton, winch, A-frame	-	210	1	60	15	9	-	72	-	648	62	24	240	17	8
Sideboom, 572	-	200	1	60	20	12	-	68	-	816	78	30	302	22	11
Air compressor, 900 ft^3/min	-	200	1	60	15	9	-	63	-	567	54	21	210	15	7
Firing Line															
Truck, 300A welder	-	175	12	108	80	1,037	-	30	-	31,110	2,963	1,151	11,511	840	404
Truck, flatbed, 2-ton	-	175	1	108	30	32	-	70	-	2,240	213	83	829	60	29
Coat Joints and Fittings															
Buffing rig	-	45	1	108	50	54	-	23	-	1,242	118	46	460	34	16
Lower-in															
Sideboom, 583	-	300	5	108	70	378	-	90	-	34,020	3,240	1,259	12,587	919	442
Clam dragline, 1-yd^3	-	200	1	108	50	54	-	63	-	3,402	324	126	1,259	92	44
Truck, flatbed, 2-1/2-ton	-	200	1	108	30	32	-	63	-	2,016	192	75	746	54	26
Tie-in															
Sideboom, 583	-	300	2	105	50	105	-	90	-	9,450	900	350	3,497	255	123
Sideboom, 572	-	200	2	105	50	105	-	68	-	7,140	680	264	2,642	193	93
Backhoe, 215	-	90	1	105	30	32	-	36	-	1,152	110	43	426	31	15
Bulldozer, D-7	-	200	1	105	40	42	-	68	-	2,856	272	106	1,057	77	37
Truck, 300A, welder	-	175	4	105	50	210	-	30	-	6,300	600	233	2,331	170	82

Table A-9 (Contd)

Unit Description	Horsepower per Unit		Units (No.)	Days Reqd on Project	Use (%)	Total Workday	Fuel (gal/unit/workday)		Total Fuel (gal)		Total Emissions (lb)				
	Gas	Diesel					Gas	Diesel	Gas	Diesel	CO	HC	NO_x	SO_2	Part.
Road/Rail Road Boring															
Truck, crane, 20-ton	-	200	2	90	30	81	-	54	-	4,374	417	162	1,618	118	57
Boring machine, 48-in.	-	75	2	90	70	126	-	36	-	4,536	432	168	1,678	122	59
Truck, flatbed, winch	-	170	2	90	30	54	-	36	-	1,944	185	72	719	52	25
Truck, 300A, welder	-	175	4	90	20	72	-	30	-	2,160	206	80	799	58	28
Backfill															
Auger backfill, D-7	-	200	2	108	10	151	-	68	-	10,268	978	380	3,799	277	133
Clam-dragline, truck	-	175	1	108	50	54	-	54	-	2,916	278	108	1,079	79	38
Bulldozer, D-7	-	200	1	108	40	43	-	68	-	2,924	278	108	1,082	79	38
Front-end loader	-	155	1	108	60	65	-	40	-	2,600	248	96	962	70	34
Dump truck, 6-yd^3	-	190	2	108	30	65	-	45	-	2,925	279	108	1,082	79	38
Air compressor, 365-ft^3/min	-	130	2	108	80	173	-	45	-	7,785	741	288	2,880	210	101
Motor grader, No. 12	-	130	1	108	60	65	-	50	-	3,250	310	120	1,203	88	42

Source: Pactex, 1983b.

Table A-10 - Pipeline Section 4 - Beaumont to Colorado River - Construction Emissions (12-month duration)

Unit Description	Horsepower per Unit		Units	Days Reqd on	Use	Total	Fuel (gal/unit/workday)		Total Fuel (gal)		Total Emissions (lb)				
	Gas	Diesel	(No.)	Project	(%)	Workday	Gas	Diesel	Gas	Diesel	CO	HC	NO_x	SO_2	Part.
Right-of-Way															
Bulldozer, D-8	-	300	1	140	60	84	-	100	-	8,400	800	311	3,108	227	109
Bulldozer, D-7	-	200	2	140	60	168	-	75	-	18,600	1,200	456	4,662	340	164
Truck, flatbed, 2-ton	175	-	1	140	20	28	72	-	2,016	-	1,814	153	105	10	32
Haul and String Pipe															
Truck crane, 20-ton	-	-	1	190	83	158	-	54	-	8,532	813	316	3,157	230	111
Sideboom, 572	-	-	1	190	80	152	-	75	-	11,400	1,086	422	4,218	308	148
String truck and trailer	-	-	12	190	83	1,892	-	68	-	128,655	12,253	4,760	47,602	3,474	1,673
Tow tractor, D-7	-	-	1	190	40	76	-	75	-	5,700	543	211	2,109	154	74
Ditch															
Backhoe	-	135	4	230	70	644	-	54	-	34,775	2,360	917	9,167	669	322
Dragline, 3/4-yd^3, truck MTD	-	162	1	230	40	92	-	54	-	4,968	473	184	1,838	134	65
Dozer/ripper, D-8	-	300	1	230	50	115	-	100	-	11,500	1,095	426	4,855	311	150
Trenching Machine, 400	-	165	1	230	80	184	-	63	-	11,592	1,104	429	4,289	313	151
Dozer w/winch, D-7	-	200	1	230	40	92	-	75	-	6,900	657	255	2,553	186	90
Bend															
Bending machine, 42-in	150	-	1	230	30	69	23	-	1,587	-	1,488	121	83	8	25
Sideboom, 572	-	800	1	230	30	69	-	75	-	5,175	493	191	1,915	140	67
Air compressor, 150-ft^3/min	-	45	1	230	30	69	-	18	-	1,242	118	46	460	34	16
Welding															
Sideboom, 583	-	300	2	230	80	368	-	100	-	36,800	3,505	1,362	13,616	994	478
Tack tractor, D-6	-	140	2	230	80	368	-	50	-	18,400	1,752	681	6,808	497	239
Air compressor, 150-ft^3/min	-	45	1	230	80	184	-	18	-	3,312	315	123	1,255	89	43
Truck, utility w/300A welder	165	-	12	230	80	2,208	36	-	79,488	-	71,539	6,041	4,133	397	1,272
Skid truck, 2-1/2-ton flatbed	175	-	2	230	40	184	72	-	13,248	-	11,923	1,007	689	66	212
Flatbed, 2-ton	175	-	1	230	30	69	68	-	4,692	-	4,223	357	244	23	75
Coat Joints and Fittings															
Buffing rig	-	45	1	230	50	115	-	23	-	2,645	252	98	979	71	34
Flatbed truck, 2-ton	175	-	1	230	40	92	66	-	-	6,256	5,630	475	325	31	100
Lower-in and Tie-in															
Sideboom, 583	-	300	7	230	70	1,127	-	100	-	112,700	10,734	4,170	41,699	3,043	1,495
Sideboom, 572	-	200	2	230	50	230	-	75	-	17,250	1,643	638	6,383	466	224
Clam dragline, 1-yd^3	-	200	1	230	50	115	-	63	-	7,240	690	268	2,681	196	94
Backhoe, 215	-	90	1	230	40	92	-	36	-	3,312	315	123	1,225	89	43

Table A-10 (Contd)

Unit Description	Horsepower per Unit Gas	Horsepower per Unit Diesel	Units (No.)	Days Reqd on Project	Use (%)	Total Workday	Fuel (gal/unit/workday) Gas	Fuel (gal/unit/workday) Diesel	Total Fuel (gal) Gas	Total Fuel (gal) Diesel	Total Emissions (lb) CO	HC	NO_x	SO_2	Part.
Lower-in and Tie-in (Contd)															
Bulldozer, D-7	-	200	1	230	40	92	-	75	-	6,900	657	255	2,563	186	90
Truck, utility w/300A welder	165	-	4	230	50	460	36	-	16,560	-	14,904	1,259	861	83	265
Truck, flatbed, 2-1/2-ton	175	-	2	230	30	138	72	-	9,936	-	8,942	755	517	50	159
Carryall, 1-ton	175	-	1	230	30	69	41	-	2,829	-	2,546	215	147	14	45
Road and Rail Borings															
Truck crane, 20-ton	-	200	1	150	30	45	-	54	-	2,430	231	90	8,099	66	32
Boring machine, 48-in.	-	75	1	150	70	105	-	36	-	3,700	352	137	1,369	100	48
Truck, flatbed w/winch, 2-1/2-ton	-	170	1	150	30	45	-	36	-	1,620	154	60	599	44	21
Truck, utility w/300A welder	165	-	1	150	20	30	41	-	1,230	-	1,107	93	64	6	20
Backhoe, 3/4-yd^3	-	135	1	150	20	30	-	54	-	1,620	154	60	599	44	21
Backfill															
Auger backfiller, D-7	-	200	2	230	70	322	-	75	-	24,150	2,300	894	8,936	652	314
Clam/dragline, 3/4-yd machine MTD	-	162	1	230	50	115	-	54	-	6,210	591	230	2,298	168	81
Bulldozer, D-7	-	200	1	230	40	92	-	75	-	6,900	657	255	2,553	186	90
Front-end loader	-	155	1	230	60	138	-	41	-	5,658	539	209	2,093	153	74
Dump truck, 6-yd^3	-	190	2	230	30	138	-	45	-	6,210	591	230	2,298	168	81
Air compressor, 365	-	130	2	230	70	322	-	45	-	14,490	1,380	536	5,361	591	188
Motor grader, No.12	-	130	1	230	60	138	-	50	-	6,900	657	255	2,553	186	90
Fabrication															
Truck crane, 20-ton	-	200	1	200	20	40	-	54	-	2,160	206	80	799	58	28
Truck, 4-ton w/winch and A frame	-	210	1	200	20	40	-	81	-	3,240	309	120	1,199	87	42
Air compressor, 150-ft^3/min	-	45	1	200	15	30	-	18	-	540	51	20	200	15	7
Truck, Utility, w/300A welder	165	-	4	200	50	100	45	-	4,500	-	4,050	342	234	23	72
Truck, utility, 1-ton	165	-	1	200	20	40	30	-	1,440	-	1,296	109	75	7	23
Fencing															
Farm tractor w/auger	-	40	1	90	40	30	-	18	-	540	51	20	200	15	7
Utility truck, 1-ton w/trailer	165	-	1	90	20	18	41	-	738	-	664	56	38	4	12
Revegetation															
Farm tractor w/attachments	-	60	1	100	60	60	-	27	-	1,680	154	60	599	44	21
Truck, 2-ton w/fertilizer breaker	175	-	1	100	30	30	72	-	2,160	-	1,944	164	112	11	35
Truck w/3,000-gal No. water tank	-	150	1	100	30	30	-	27	-	810	77	30	300	22	11

Table A-10 (Contd)

Unit Description	Horsepower per Unit Gas	Horsepower per Unit Diesel	Units (No.)	Days Req'd on Project	Use (%)	Total Workday	Fuel (gal/unit/workday) Gas	Fuel (gal/unit/workday) Diesel	Total Fuel (gal) Gas	Total Fuel (gal) Diesel	Total Emissions (lb) CO	HC	NO_x	SO_2	Part.
Cleanup															
Motor grader, No. 12	-	130	1	230	50	115	-	50	-	5,750	548	213	2,128	153	75
Dump truck, 6-yd	-	190	4	230	40	368	-	45	-	16,560	1,577	613	6,127	447	215
Gradeall, 1/2-yd	-	90	1	230	50	115	-	45	-	4,600	438	170	1,702	124	60
Flatbed truck, 2-ton	175	-	1	230	30	69	72	-	4,968	-	4,471	378	258	25	79
Bulldozer, D-7	-	200	1	230	50	115	-	68	-	7,820	745	289	2,893	211	102
Front-end loader	-	155	1	230	60	138	-	41	-	5,658	539	209	2,093	153	74
Testing															
Truck tractor w/40-ton	-	375	1	100	20	20	-	63	-	1,260	120	47	466	34	16
Pump, 6-in.	50	-	2	100	30	60	27	-	1,680	-	1,458	123	84	8	26
Pump, 10-in.	-	80	1	100	25	25	-	36	-	900	86	55	333	24	12
Pressure pump and truck	200	-	1	100	15	15	36	-	540	-	486	41	28	3	9
Truck, 4-ton w/winch and A frame	-	210	1	100	15	15	-	81	-	1,215	116	45	450	33	16
Sideboom, 572	-	200	1	100	20	20	-	68	-	1,360	130	50	503	37	18
Air compressor, 900 ft^3/min	-	280	1	100	15	15	-	63	-	945	90	35	350	26	12
Field Services-O.H.															
Truck tractor w/60-ton	-	375	2	260	40	208	-	63	-	13,104	1,248	485	4,848	354	170
Truck tractor w/25-ton	-	200	2	260	50	260	-	54	-	14,040	1,337	519	5,195	379	183
Truck, stake bed, 2-ton	175	-	2	260	50	260	72	-	18,720	-	16,848	1,423	973	94	300
Truck, fuel w/3,000-tank	-	150	2	260	40	208	-	27	-	5,616	535	208	2,078	152	73
Truck, grease	195	-	2	260	30	156	36	-	5,616	-	5,054	427	292	28	90
Truck, utility w/300A welder	165	-	2	260	40	208	36	-	7,488	-	6,739	569	389	37	120
Truck, carryall, 1-ton	165	-	2	260	50	260	41	-	10,660	-	9,594	810	554	53	171
Truck, mechanics	165	-	4	260	20	208	36	-	7,488	-	6,739	569	389	37	120

Source: Pactex, 1983b.

Table A-11 - Tanker Emission Factors
for 0.025% Sulfur Residual Fuel
(lb/thousand gallons)

Activity	Part.	SO_2[a]	CO	HC	NO_x[b]
Propulsion (cruise)	20.0	39.75	3.45	0.682	31.0
Pumping (full)	56.5	39.75	7.27	1.72	31.0
Hoteling	10.0	39.75	Neg.	3.2	31.0

[a] SO_2 based on 159 x 0.25% sulfur = 39.75 lb/10^3 gal.
[b] NO_x factor based on 0.15% by weight N_2 in residual oil and Table 1.3-1, Footnote (j) where NO_2 lb/10^3 gal = 22 + 400 $(0.15)^2$.
Source: EPA, 1977; Tables 1.3-1 and 3.2.3-2.

Table A-12 - Tanker Average Visit and Annual Fuel Consumption[a]

Activity	80,000 dwt		120,000 dwt		165,000 dwt	
	Avg/Visit (gal)	Annual Avg (10^3 gal)	Avg/Visit (gal)	Annual Avg (10^3 gal)	Avg/Visit (gal)	Annual Avg (10^3 gal)
Propulsion						
In	646	102.71	796	127.36	714	63.55
Out	369	58.67	455	72.80	408	36.31
Subtotal	1,015	161.39	1,251	200.16	1,122	99.86
Pumping						
PR1 (max)	11,135	1,770.47	19,202	3,072.32	22,715	2,021.64
PR2	1,134	180.31	1,415	226.40	1,625	144.63
PR3	-	-	819	131.04	633	56.34
Stripping	444	70.60	779	124.64	923	83.15
Subtotal	12,713	2,021.38	22,215	3,554.40	25,896	2,304.76
Hoteling[b]	-	-	-	-	-	-
Total	13,728	2,182.77	23,466	3,754.56	27,018	2,404.62

[a]Annual average fuel consumption based on the average quantity of fuel consumed per visit multiplied by the number of visits per year for each tanker class.
[b]On average basis, hoteling is included with propulsion and pumping fuel consumption. Additional hoteling should not be required.
Source: Pactex, 1983; ES, 1985.

Table A-13 - Average Daily Potential Tanker Emissions (lb/day)

Activity	Part.	SO_2[a]	CO	HC	NO_x[a]
Propulsion					
80,000 dwt	8.82	17.58	1.53	0.27	13.69
120,000 dwt	10.95	21.79	1.92	0.38	16.97
165,000 dwt	5.48	10.84	0.93	0.16	8.49
Subtotal	25.25	50.21	4.38	0.81	39.15
Pumping					
80,000 dwt	312.66	220.01	40.25	9.47	171.55
120,000 dwt	549.81	387.02	70.75	16.76	301.66
165,000 dwt	356.47	250.84	45.89	10.84	195.59
Subtotal	1,218.95	857.87	156.89	37.07	668.80
Less 17%[b]	1,011.75	712.03	130.22	30.77	555.10
Hoteling[c]					
80,000 dwt	-	-	-	-	-
120,000 dwt	-	-	-	-	-
165,000 dwt	-	-	-	-	-
Total	1,037.00	762.24	134.60	31.58	594.25
Ton/day (2,000 lb)	0.52	0.38	0.07	0.02	0.30

[a]Based on residual fuel containing 0.15% by weight N_2.
[b]Reduction caused by inert gas system.
[c]Hoteling emissions are included in propulsion and pumping emissions.
Source: Pactex, 1983; ES, 1985.

APPENDIX B

BUREAU OF LAND MANAGEMENT ROW GRANT STIPULATIONS
FOR THE ROSWELL DISTRICT

Throughout the Carlsbad Resource Area reseeding will be required on all portions of the ROW where blading occurs. Seeding will be done with a disk-type drill. The seeder will be followed by a drag, packer, or rollers to ensure adequate compaction. The different seed mixtures and the areas in which they are to be used, are given in Tables B-1 and B-2.

Table B-1 - Seed Mixtures

Mixture	Species	Pounds per acre of pure live seed[a]
Loamy	Lehmann's lovegrass (Eragrostis lehmannlana)	0.25
	Sand dropseed (Sorobolus cryptandrus)	0.25
Sandy	Sand dropseed	0.25
	Sand lovegrass (Eragrostis trichodes)	0.50
	Little bluestem (Andropogon scorparius)	0.25
Gypsum	Alkali sacaton (Sprobolus airoides)	0.25
	Four-wing saltbush (Atriplex canescens)	9.00
	Sand dropseed	0.25

[a]Percent pure live seed = percent purity/percent germination.

Table B-2 - Areas to be Seeded

Seed Mixture	Areas (all in 126S)
Sandy	Range 38E, 37E, 36E, 35E, 34E, 32E
Loamy	Range 33E, 30E, 29E
Gypsum	Range 27E

NM_____

STANDARD STIPULATIONS FOR PIPELINE AND UNDERGROUND CABLE
RIGHTS-OF-WAY IN THE ROSWELL DISTRICT, BLM

Grantee agrees to comply with the following stipulations to the satisfaction of the BLM's Roswell District Manager:

1. Clearing and blading necessary for construction will be held to the absolute minimum. Without prior agreement, these actions will not exceed those limits agreed upon at the pre-construction inspection. Vegetation removed will be "walked-down" in place.

2. Care will be taken by the grantee to assure that scenic values are not damaged in the disposal of waste materials. Any large rocks which are left as a result of construction activities will be placed so that they do not detract from the scenic view and do not hinder the movement of livestock or of big game animals. These residual rocks will not be piled or left in rows.

3. Roads will not be constructed where terrain features permit vehicles to maneuver without the aid of such construction. All vehicular traffic and construction activity will be confined to the authorized right-of-way.

4. Grantee will post the BLM serial number assigned to this right-of-way in a conspicuous place where this right-of-way intersects existing roads or highways. Along rights-of-way paralleling roads, BLM serial numbers will be posted where the right-of-way first crosses the public lands and where it finally leaves the public lands, unless otherwise agreed upon.

5. If a natural barrier which is being used for livestock control, is broken during construction, the grantee will adequately fence the area to prevent drift of livestock. Such fencing will be at his own expense.

6. To prevent slacking of fence wire, the grantee will brace and tie-off each existing fence to be crossed, before cutting. During construction, the opening will be protected to prevent the escape of livestock. Fences which have been cut during construction will be restored by the grantee to a condition which is equal to, or better than the original. Cattlegaurds and adjacent gates which are of a suitable width will also be installed in any fence where a road created during construction is to be regularly traveled.

7. Gates or cattlegaurds on public lands will not be locked or closed to public use by the grantee.

8. Compatible with construction requirements, the period of time that trenches and other excavations are kept open by the grantee, will be held to a minimum.

9. Grantee (will) (will not) reseed. If reseeding is required, it will be done according to the following requirements for BLM's Roswell District:

☐ seed mixture 1
☐ seed mixture 2
☐ seed mixture 3
☐ seed mixture 4

10. All above-ground structures which are not subject to safety requirements, will be painted by the grantee to blend with the natural landscape. The paint used will be a color which simulates Federal Standard No. 595A:

(OVER)

☐ color 20318

☐ color 30318

☐ color 26357

☐ color 36357

☐ color_____

11. In those areas where erosion control structures are required to stabilize soil conditions, the grantee will install such structures as are suitable for the specific soil conditions being encountered and which are in accordance with sound resource management practices.

12. Upon cancellation, relinquishment, or expiration of this right-of-way, the grantee will comply with those abandonment procedures as prescribed by BLM's Roswell District Manager.

13. Special stipulations:

BY _____ DATE _____

(November 1979)

NM _____

STANDARD STIPULATIONS FOR OIL AND GAS RELATED PLANT SITES
IN THE ROSWELL DISTRICT, BLM

Grantee agrees to comply with the following stipulations to the satisfaction of BLM's Roswell District Manager:

1. The grantee will take those actions necessary which will assure that land or water resources do not become polluted because of the actions authorized by this grant, that the existing aquatic life is not damaged, and that extraneous matter does not enter and damage any mineral or water-bearing formation. All liquid and nonliquid waste materials shall be disposed of by the operator as prescribed by applicable federal and state regulations.

2. The grantee will keep storage tanks, pipes, and other improvements in good condition. Leaks will be repaired immediately to prevent environmental damage to land and/or water resources.

3. All above-ground structures which are not subject to safety requirements, will be painted by the grantee to blend with the natural landscape. The color of paint used will simulate Federal Standard No. 595A:

☐ Color 20318
☐ Color 30318
☐ Color 26357
☐ Color 36357
☐ Color ____

4. In those areas where erosion control structures are required to stabilize soil conditions, the grantee will install such structures as are suitable for the soil conditions being encountered and which are in accordance with sound resource management practices.

5. Grantee will post the BLM serial number assigned to this authorization in a conspicuous place on the site.

6. Upon cancellation, relinquishment, or expiration of this right-of-way, the grantee will comply with those abandonment procedures as prescribed by BLM's Roswell District Manager.

7. Special stipulations:

BY _____ DATE _____

(November 1979)

NM _____

STANDARD STIPULATIONS FOR CATHODIC PROTECTION SITES
IN THE ROSWELL DISTRICT, BLM

Grantee agrees to comply with the following stipulations to the satisfaction of BLM's Roswell District Manager.

1. Clearing and blading necessary for construction will be held to the absolute minimum. Without prior agreement, these actions will not exceed those limits agreed upon at the pre-construction inspection. Vegetation removed will be "walked-down" in place.

2. Care will be taken by the grantee to assure that scenic values are not damaged in the disposal of waste materials. Any large rocks which are left as a result of construction activities will be placed so that they do not detract from the scenic view and do not hinder the movement of livestock or of big game animals. These residual rocks will not be piled or left in rows.

3. Roads will not be constructed where terrain features permit vehicles to maneuver without the aid of such construction. All vehicular traffic and construction activity will be confined to the authorized right-of-way.

4. All above-ground structures which are not subject to safety requirements will be painted by the grantee to blend with the natural landscape. The paint used will be a color which simulates Federal Standard No. 595A:

☐ color 20318
☐ color 30318
☐ color 26357
☐ color 36357
☐ color ____

5. In those areas where erosion control structures are required to stabilize soil conditions, the grantee will install such structures as are suitable for the specific soil conditions being encountered and which are in accordance with sound resource management practices.

6. Grantee will post the BLM serial number assigned to this site in a conspicuous place on the site.

7. Compatible with construction requirements, the period of time that trenches and other excavations are kept open by the grantee, will be held to a minimum.

8. Upon cancellation, relinquishment, or expiration of this right-of-way, the grantee will comply with those abandonment procedures as prescribed by BLM's Roswell District Manager.

9. Special stipulations:

BY _____ DATE _____

(November 1979)

APPENDIX C

CEQA INITIAL STUDY AND CHECKLIST FOR THE PROPOSED PACIFIC TEXAS PIPELINE COMPANY PROJECT

A copy of the Initial Study and Checklist, which was issued with the Notice of Preparation by the Los Angeles Harbor Department, is reprinted in this appendix.

CITY OF LOS ANGELES
OFFICE OF THE CITY CLERK
ROOM 395, CITY HALL
LOS ANGELES, CALIFORNIA 90012

CALIFORNIA ENVIRONMENTAL QUALITY ACT

INITIAL STUDY AND CHECKLIST

(Article IV — City CEQA Guidelines)

LEAD CITY AGENCY	COUNCIL DISTRICT	DATE
LOS ANGELES HARBOR DEPARTMENT	15th	1-15-85

PROJECT TITLE/NO.	CASE NO.
PROPOSED PACIFIC TEXAS PIPELINE CO. PROJECT	NA

PREVIOUS ACTIONS CASE NO.	
NA	☐ **DOES** have significant changes from previous actions. ☐ **DOES NOT** have significant changes from previous actions.

PROJECT DESCRIPTION:

SEE ATTACHMENT NO. 1

PROJECT LOCATION

OUTER LOS ANGELES HARBOR SOUTH OF TERMINAL ISLAND IN THE PORT OF LOS ANGELES WITH A CRUDE OIL PIPELINE SYSTEM TO MIDLAND, TEXAS (SEE ATTACHMENT NO. 1)

PLANNING DISTRICT		STATUS: ☐ PRELIMINARY ☐ PROPOSED _____ ☐ ADOPTED date
EXISTING ZONING M3	MAX. DENSITY ZONING	PROJECT DENSITY
PLANNED LAND USE & ZONE	MAX. DENSITY PLAN	☐ DOES CONFORM TO PLAN ☐ DOES NOT CONFORM TO PLAN ☐ NO DISTRICT PLAN
PLAN DENSITY RANGE	PROJECT DENSITY	

☞ **DETERMINATION** (to be completed by Lead City Agency)

On the basis of the attached initial study checklist and evaluation:

NEGATIVE DECLARATION	☐ I find the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
CONDITIONAL NEGATIVE DECLARATION	☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because the mitigation measures described on an attached sheet have been added to the project. A CONDITIONAL NEGATIVE DECLARATION WILL BE PREPARED. (See attached condition(s))
ENVIRONMENTAL IMPACT REPORT	☒ I find the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

Alan Hurst — SIGNATURE

HARBOR ENVIRONMENTAL SCIENTIST — TITLE

INITIAL STUDY CHECKLIST (To be completed by Lead City Agency)

BACKGROUND

PROPONENT NAME PACIFIC TEXAS PIPELINE COMPANY	PHONE (213) 590-8888
PROPONENT ADDRESS 555 EAST OCEAN BLVD., SUITE 525 LONG BEACH CA 90802	
AGENCY REQUIRING CHECKLIST LOS ANGELES HARBOR DEPARTMENT	DATE SUBMITTED 12-19-84
PROPOSAL NAME (If applicable) PACIFIC TEXAS PIPELINE CO. PROJECT	

ENVIRONMENTAL IMPACTS

(Explanations of all "yes" and "maybe" answers are required to be attached on separate sheets.)

	YES	MAYBE	NO
1. EARTH. Will the proposal result in:			
a. Unstable earth conditions or in changes in geologic substructures?			X
b. Disruptions, displacements, compaction or overcovering of the soil?	X		
c. Change in topography or ground surface relief features?	X		
d. The destruction, covering or modification of any unique geologic or physical features?			X
e. Any increase in wind or water erosion of soils, either on or off the site?		X	
f. Changes in deposition or erosion of beach sands, or changes in siltation, deposition or erosion which may modify the channel of a river or stream or the bed of the ocean or any bay, inlet or lake?		X	
g. Exposure of people or property to geologic hazards such as earthquakes, landslides, mudslides, ground failure, or similar hazards?	X		
2. AIR. Will the proposal result in:			
a. Air emissions or deterioration of ambient air quality?	X		
b. The creation of objectionable odors?			X
c. Alteration of air movement, moisture or temperature, or any change in climate, either locally or regionally?			X
d. Expose the project residents to severe air pollution conditions?		X	
3. WATER. Will the proposal result in:			
a. changes in currents, or the course or direction of water movements, in either marine or fresh waters?	X		
b. Changes in absorption rates, drainage patterns, or the rate and amounts of surface water runoff?	X		
c. Alterations to the course or flow of flood waters?			X
d. Change in the amount of surface water in any water body?	X		
e. Discharge into surface waters, or in any alteration of surface water quality, including but not limited to temperature, dissolved oxygen or turbidity?	X		
f. Alteration of the direction or rate of flow of ground waters?			X
g. Change in the quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?		X	
h. Reduction in the amount of water otherwise available for public water supplies?			X
i. Exposure of people or property to water related hazards such as flooding or tidal waves?		X	
j. Changes in the temperature, flow, or chemical content of surface thermal springs.			X
4. PLANT LIFE. Will the proposal result in:			
a. Change in the diversity of species, or number of any species of plants (including trees, shrubs, grass, crops and aquatic plants)?	X		
b. Reduction of the numbers of any unique, rare or endangered species of plants?		X	
c. Introduction of new species of plants into an area, or is a barrier to the normal replenishment of existing species?		X	
d. Reduction in acreage of any agricultural crop?		X	

	YES	MAYBE	NO
5. ANIMAL LIFE. Will the proposal result in:			
a. Change in the diversity of species, or numbers of any species of animals (birds, land animals including reptiles, fish and shellfish, benthic organisms or insects)?	X		
b. Reduction of the numbers of any unique, rare or endangered species of animals?		X	
c. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals?		X	
d. Deterioration to existing fish or wildlife habitat?	X		
6. NOISE. Will the proposal result in:			
a. Increases in existing noise levels?	X		
b. Exposure of people to severe noise levels?			X
7. LIGHT AND GLARE. Will the proposal			
a. Produce new light or glare from street lights or other sources?	X		
b. Reduce access to sunlight of adjacent properties due to shade and shadow	X		
8. LAND USE. Will the proposal result in an alteration of the present or planned land use of an area?	X		
9. NATURAL RESOURCES. Will the proposal result in:			
a. Increase in the rate of use of any natural resources?	X		
b. Depletion of any non-renewable natural resource?	X		
10. RISK OF UPSET. Will the proposal involve:			
a. A risk of an explosion or the release of hazardous substances (including, but not limited to, oil, pesticides, chemicals or radiation) in the event of an accident or upset conditions?	X		
b. Possible interference with an emergency response plan or an emergency evacuation plan.			X
11. POPULATION. Will the proposal result in:			
a. The relocation of any persons because of the effects upon housing, commercial or industrial facilities?			X
b. Change in the distribution, density or growth rate of the human population of an area?		X	
12. HOUSING. Will the proposal:			
a. Affect existing housing, or create a demand for additional housing?		X	
b. Have an impact on the available rental housing in the community?			X
c. Result in demolition, relocation or remodeling of residential, commercial, or industrial buildings or other facilities?		X	
13. Transportation/Circulation. Will the proposal result in:			
a. Generation of additional vehicular movement?	X		
b. Effects on existing parking facilities, or demand for new parking?	X		
c. Impact upon existing transportation systems?	X		
d. Alterations to present patterns of circulation or movement of people and/or goods?	X		
e. Alterations to waterborne, rail or air traffic?	X		
f. Increase in traffic hazards to motor vehicles, bicyclists or pedestrians?			X
14. PUBLIC SERVICES. Will the proposal have an effect upon, or result in a need for new or altered governmental services in any of the following areas:			
a. Fire protection?	X		
b. Police protection?		X	
c. Schools?			X
d. Parks or other recreational facilities?		X	
e. Maintenance of public facilities, including roads?		X	
f. Other governmental services?		X	
15. ENERGY. Will the proposal result in:			
a. Use of exceptional amounts of fuel or energy?			X
b. Increase in demand upon existing sources of energy, or require the development of new sources of energy?	X		

	YES	MAYBE	NC
16. ENERGY. Will the proposal result in:			
a. Use of exceptional amounts of fuel or energy?			
b. Significant increase in demand upon existing sources of energy, or require the development of new sources of energy?		SEE # 15	
17. UTILITIES. Will the proposal result in a need for new systems, or alterations to the following utilities:			
a. Power or natural gas?	X		
b. Communications systems?	X		
c. Water?	X		
d. Sewer or septic tanks?	X		
e. Storm water drainage?	X		
f. Solid waste and disposal?	X		
18. HUMAN HEALTH. Will the proposal result in:			
a. Creation of any health hazard or potential health hazard (excluding mental health)?		X	
b. Exposure of people to potential health hazards?		X	
19. AESTHETICS. Will the proposed project result in:			
a. The obstruction of any scenic vista or view open to the public?		X	
b. The creation of an aesthetically offensive site open to public view?		X	
c. The destruction of a stand of trees, a rock outcropping or other locally recognized desirable aesthic natural feature?		X	
d. Any negative aesthetic effect?		X	
20. RECREATION. Will the proposal result in an impact upon the quality or quantity of existing recreational opportunities?		X	
21. CULTURAL RESOURCES:			
a. Will the proposal result in the alteration of or the destruction of a prehistoric or historic archaeological site?		X	
b. Will the proposal result in adverse physical or aesthetic effects to a prehistoric or historic building, structure, or object?		X	
c. Does the proposal have the potential to cause a physical change which would affect unique ethnic cultural values?		X	
d. Will the proposal restrict existing religious or sacred uses within the potential impact area?		X	
22. MANDATORY FINDINGS OF SIGNIFICANCE.			
a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	X		
b. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals.	X		
c. Does the project have impacts which are individually limited, but cumulatively considerable?*	X		
d. Does the project have environmental effects which cause substantial adverse effects on human beings, either directly or indirectly?			X

* "Cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.

DISCUSSION OF ENVIRONMENTAL EVALUATION

(Attach additional sheets if necessary)

SEE ATTACHMENT NO. 2

PREPARED BY	TITLE	TELEPHONE	DATE
LILLIAN KAWASAKI *lyk*	ASST. ENVIRONMENTAL SCIENTIST II	(213)5193680	1-15-85

ATTACHMENT NO. 1

PACIFIC TEXAS PIPELINE

PROJECT DESCRIPTION

PROJECT OBJECTIVES

Pacific Texas Pipeline Corporation is a privately held corporation, which is planning to build an underground pipeline system from the outer Los Angeles Harbor to Midland, Texas (Figure 1). Pacific Texas will operate this pipeline as a common carrier. As a common carrier, the pipeline will transport surplus crude oil primarily from the Alaska North slope. Additionally, crude oil from California production areas, and other Pacific Rim countries could be delivered to the berthing facility. From the berthing facility in Los Angeles Harbor, this crude oil would be transported to Midland, Texas where it would enter the transcontinental pipeline. The Pacific Texas Pipeline will benefit the U.S. population by (1) lowering the cost of oil transportation 1-2.3 cents per gallon, (2) reducing crude oil market delivery time, and (3) by creating a crude oil shipping route completely within U.S. boundaries; therefore, not subject to interruption by foreign powers. Currently, West Coast crude oil is shipped to the Gulf Coast by way of Panama.

The project will benefit the local areas through which it will pass by providing up to 3,000 jobs during construction and up to 200 permanent jobs. The project will benefit the petroleum industry by providing (1) a transportation route for crude oil less influenced by weather delay or tanker delay, thus reducing inventory costs and (2) a reduction in direct transportation costs.

PROJECT COMPONENTS

The Pacific Texas Pipeline will be comprised of the following components:

(1) Two tanker berths located in the outer harbor of Los Angeles south of Terminal Island on a landfill island to be constructed (Figure 2).

(2) Terminal facility for the storage of up to 6 million barrels of incoming crude oil. Three alternatives for the terminal location are being considered. As currently proposed, the primary alternative is located on the Johns Manville property on 223rd Street in Carson. Two alternative locations in the Port of Los Angeles are also being investigated - one on the 190-acre landfill and the other in the classification yard area south of Pacific Coast Highway. The Port alternatives may require a portion of the terminal storage to be located at a facility in Rialto. No oil refining will take place at the terminal facilities.

(3) Twin 48" buried pipelines from the berthing facility to the terminal facility. These pipelines will run beneath the floor of the harbor to shoreline, and from shoreline to the terminal facilities.

(4) Approximately 1,030 miles of below-ground 42" pipeline from the terminal facility to Midland, Texas. The pipeline will be primarily along existing pipeline right-of-way throughout its length and then proceed east, south of Phoenix, north of Tucson and El Paso on its way to the terminal at Midland, Texas.

(5) Eleven above-ground pump stations along the route are to be constructed in the vicinity of:

California - Los Angeles, Rialto, Blythe
Arizona - Livingston, Gila, Coolidge, Redington
New Mexico - Lordsburg, Akela, Hueco
Texas - Jal

(6) Terminal facility, consisting of new tanks at Midland, Texas, which will store up to 4 million barrels of crude oil. The Midland facility can connect up to 14 other pipeline systems which service 75 refineries; however, these other pipelines and refineries are not part of the project. No refining will take place at the Midland terminal.

The estimated cost of construction is 1.66 billion dollars. The project will take 18 months to construct. Estimated start up date for construction is December 1985 or January 1986.

Pipeline Construction

Construction of the pipeline would be accomplished by the use of several construction crews working concurrently at various locations of the pipeline. The normal right-of-way for construction would be 100 feet. Construction would generally proceed in the following manner:

(1) Clearing and grading of right-of-way.

(2) Ditching to a depth which will provide a minimum of three feet of cover over the pipe.

(3) Transporting the pipeline to the site and readying it for placement in the ditch.

(4) Welding and inspection of completed welds.

(5) Coating of the pipe to prevent erosion or coating of the joints of precoated line pipe.

(6) Lowering pipe and welding pipe together at crossings and special points.

(7) Backfilling with original soil and clean up and restoration of right-of-way.

Storage of construction material and equipment will be kept to a minimum along the route. Often, equipment will be stored at pumping station locations.

Berthing Facility Construction

Construction work involved at the Port berthing area will include:

(1) A construction staging area of approximately 40 acres in the Port of Los Angeles.

(2) Building two 1500' berths for the tankers to unload, which will include the construction of flexible boom arms with safety release to unload crude oil from ships.

(3) Dredging of approximately 15 million cubic yards of sandy material constructing a 75' deep channel, turning basin and berthing area to accommodate large tankers.

(4) The creation of an approximate 150-acre landfill from the dredged material. A metering facility and essential services such as transportation, security, fire safety and utilities will be provided.

(5) Installation of an innovative emission control system for the tankers off-loading. The system will include:

A filtering system to reduce particulates.

Preheating of emission gases to proper temperatures to enter the catalytic system thereby converting CO to CO_2 and oxidizing reactive organic gases.

Catalytic reduction system to reduce NO_x.

A scrubber system to reduce SO_2.

This technology will assist Pacific Texas toward compliance with the requirements of the South Coast Air Quality Management District.

The Pacific Texas berthing facility will generate an average of 400 tanker calls per year in Los Angeles harbor. It should be noted that many of these ships presently enter Los Angeles/Long Beach Harbor to perform various activities in transit to the Panama Canal.

Terminal Facility Construction

The construction of the terminal facilities will proceed concurrently with the construction of the pipeline and will include:

(1) Clearing and grading of the selected sites.

(2) Construction of all necessary improvements, including tanks, tank manifolds, utilities, sumps.

(3) Construction of containment dikes.

(4) Collection and treatment of run-off into sumps.

Pump Station Construction

Pumping station construction along the route will be coordinated so that, when possible, they will allow use of the site as a staging area for pipeline construction.

After use as a staging area, pump station construction will include:

(1) Clearing and grading of the site.

(2) Construction of all necessary improvements, including mainline pumps, substation, control valves, scraper launcher and receiver. Utilities will be provided.

(3) Site restoration and landscaping.

Pipeline Route

Once the pipeline leaves the Los Angeles Metropolitan area, it will be routed through mainly rural areas of California, Arizona, New Mexico and Texas. The pipeline will pass through six major biomes, including the California Coastal Biome, the Colorado Desert Biome, the Yuma Desert Biome, the Arizona Upland Desert Biome, the Desert-Grassland Biome and the Chihuahuan Desert Biome.

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ATTACHMENT NO. 2

DISCUSSION OF ENVIRONMENTAL EVALUATION:

1b,c. Dredging and landfilling operations on the Port area will disrupt and displace sediments and result in a change in the existing topography. The soil will also be disrupted for installation of the pipelines. The terminal facilities will be paved.

1e. Installation of the pipelines may result in temporary increase of water erosion of the soils until the construction area is revegetated.

1f. Changes in deposition or erosion may result from the dredging and landfilling activities in the Los Angeles outer harbor.

1g. There will be an exposure of people and property to potential geologic hazards. The proposed landfill and berthing areas in the Port will be located within the area of the fault rupture study zone of the Palos Verdes fault as identified in the City of Los Angeles Department of Planning Seismic Safety Plan. There are also potential hazards and risks to the pipeline due to possible faults along the route and possible slope failures in existing slide areas. Seismic and fault risks to the berthing area, terminal facilities, and pipeline will be considered.

2a,d. The project will result in air emissions from both construction and operation of the project (berth, terminal facilities, pump station, pipeline). Preliminary consultations indicate that the construction emissions with use of best available control technology (BACT) would not require offsets. The terminal facility and berthing operations in the South Coast Air Basin would require offsets under New Source Review. The proponent proposes to obtain necessary offsets and obtain from AQMD an innovative technology exemption for the tanker flue gas scrubbing system to be installed at the berthing facility. Air emissions will be analyzed and discussed in the EIR/EIS, including appropriate mitigation measures.

3a,d. Water movement in the Port's outer harbor will be altered as a result of the landfill. Results of water circulation model studies will be included in the EIR/EIS. The landfill will decrease the amount of surface water in outer harbor.

3b. Paving of the terminal facility site and installation of a drainage system will alter the existing absorption rate and drainage pattern to a minor extent.

3e. There will be an impact on surface water quality during dredging and landfill operations in the Port and possibly during construction of the pipelines in the harbor and across rivers or streams. These impacts should be temporary in nature during the construction activity.

Major oil spills or leaks would degrade the water quality in the harbor or at or downstream from a stream/river crossing.

3g. If the groundwater at the Johns Manville site in Carson which is a proposed alternative site for the terminal facility is determined to be contaminated and require clean up, the quantity of groundwater could be altered.

3i. The pipeline may be subject to flooding in areas along the route.

4a, 5a. There will be a permanent loss of marine and terrestrial plants and animals from the construction activity. Mobile animal species would be able to migrate to adjacent areas. There will be a permanent loss of habitat in the areas of the landfill, in pipeline corridors, and at the terminal facilities and pump stations. Appropriate mitigation measures will be identified and implemented. There is a potential for reduction in the diversity and abundance of biota in the event of a major oil spill.

4b, 5b. Consultations with state and federal wildlife agencies and surveys, as needed, will be conducted to determine the potential impacts to any unique, rare or endangered species of plants or animals. Formal consultations in accordance with state and federal endangered species legislation will be undertaken.

4c, 5c. After construction activity has been completed, new species of plants or animals may appear during the recolonization of the area. Trenching and other pipeline construction activity may temporarily act as a barrier to species migration.

4d. Installation of the pipeline and pump stations may result in a reduction in agricultural crop acreage. Often crops are cultivated in utility right-of-ways. Land use surveys will identify the impact, if any.

5d. Deterioration to existing fish or wildlife habitat will result from the harbor dredging and filling. There is also a potential for deterioration of fish and wildlife habitats at pipeline crossings of streams and rivers, particularly in the event of an oil spill.

6a. Construction noise would temporarily increase the existing ambient noise levels. Operational noise impacts would result principally from noise sources at the pump stations. Project-generated noise levels, identification of noise-sensitive areas and recommendations of appropriate mitigations will be addressed.

7a, b. Lighting systems will be installed at the berth, terminal facilities and pump stations and will produce new sources of light and glare. Installation of the tanks may reduce access to sunlight of adjacent properties.

8. The present land use would be altered. New land and a marine terminal would be created in Los Angeles outer harbor. Pump stations and a terminal facility would be constructed in sites currently without such facilities. An amendment to the Los Angeles Harbor Department Port Master Plan will be sought from the California Coastal Commission.

9a, b. Natural resources, including non-renewable mineral resources will be committed in the construction and operation of the proposed project. The project may result in the reduction of fossil fuel consumption in transporting crude oil from Alaska to the Gulf Coast area.

10a. Implementation of the project would produce a potential risk of upset from the accidental release of crude oil during a spill from a tanker vessel, a storage tank, or the pipeline. An oil spill contingency plan as well as a spill prevention measure plan will be developed for the project.

If the terminal facility is to be developed on the Johns Manville site in Carson, the site would be characterized in-depth and alternative mitigation measures to render a clean site would be accomplished by Manville under the direction of the California Department of Health Services. The Manville site has been identified as containing asbestos contamination.

11b, 12a. The project will generate additional employment. The effect on the distribution and density of human population and any impact or demand for housing will be addressed.

12c. In order to accommodate the project, buildings or other facilities may have to be demolished or altered prior to construction.

13a. The project will generate additional vehicular movement during construction and operation, including vehicles to/from the staging and berthing areas, terminal facility, and pump stations.

13b. Parking will be provided to accommodate the employees.

13c, d, e. The project will alter the existing marine and pipeline transportation systems. Crude oil from Alaska would be accommodated on tankers which would off-load in the Port of Los Angeles and then would be transported via pipeline to Midland, Texas for further distribution. Currently, the majority of Alaskan crude oil is transported to the Gulf Coast states via intermodal transport (tanker-pipeline-tanker) through the Isthmus of Panama or through the Panama Canal. Additionally, the proposed pipeline could handle crude oil from offshore and central California areas and Pacific Rim countries as the proposed system would be operated as a common carrier operation.

Project implementation is anticipated to increase the tanker calls to the Port of Los Angeles by approximately 400 ships per year. Many of these vessels currently enter the Los Angeles-Long Beach Harbors in-transit to Panama.

Additionally, construction of the landfill will alter the existing movement of the vessels in L.A. outer harbor and will affect existing anchorages.

14a. Plans for development of the wharf, terminal facility, and pipeline will be coordinated with the appropriate fire departments. Several preliminary meetings have been held between the Pacific Texas and the Los Angeles City Fire Department.

14b. The project may result in a need for expanded police protection/ surveillance services. In the Port, police protection is provided by the Los Angeles Harbor Port Wardens Division.

14d. The construction of the proposed pipeline may have a temporary impact on park/recreational facilities along the corridor route.

14e. Project implementation may result in a need for increased maintenance of public roads along the routes servicing the facilities.

14f. The project may affect other governmental services such as the U.S. Coast Guard. These agencies will be identified in the EIR/EIS.

15b. The project will impose greater energy utilization, particularly electrical consumption. The energy demands of the project will be determined.

17a-f. It will be necessary to provide utility service to the various operation facilities. Project utility demands will be quantified and the need, if any, to develop additional distribution facilities will be discussed in the EIR/EIS.

18a,b. Exposure of people to a potential health hazard may exist since there is a potential for a risk of upset from explosion or spill of crude oil. If the terminal facility is located in Carson on the Manville site, there may be a potential health hazard from asbestos contamination. However, the site would be characterized and necessary mitigation measures implemented by Manville under the direction of the California State Department of Health Services prior to any on-site construction activity. The new facilities also must meet the provisions of the fire department, Coast Guard, Cal O.S.H.A. and other agencies to ensure the minimum potential for a health hazard. If potentially significant impacts are identified, mitigation measures would be required.

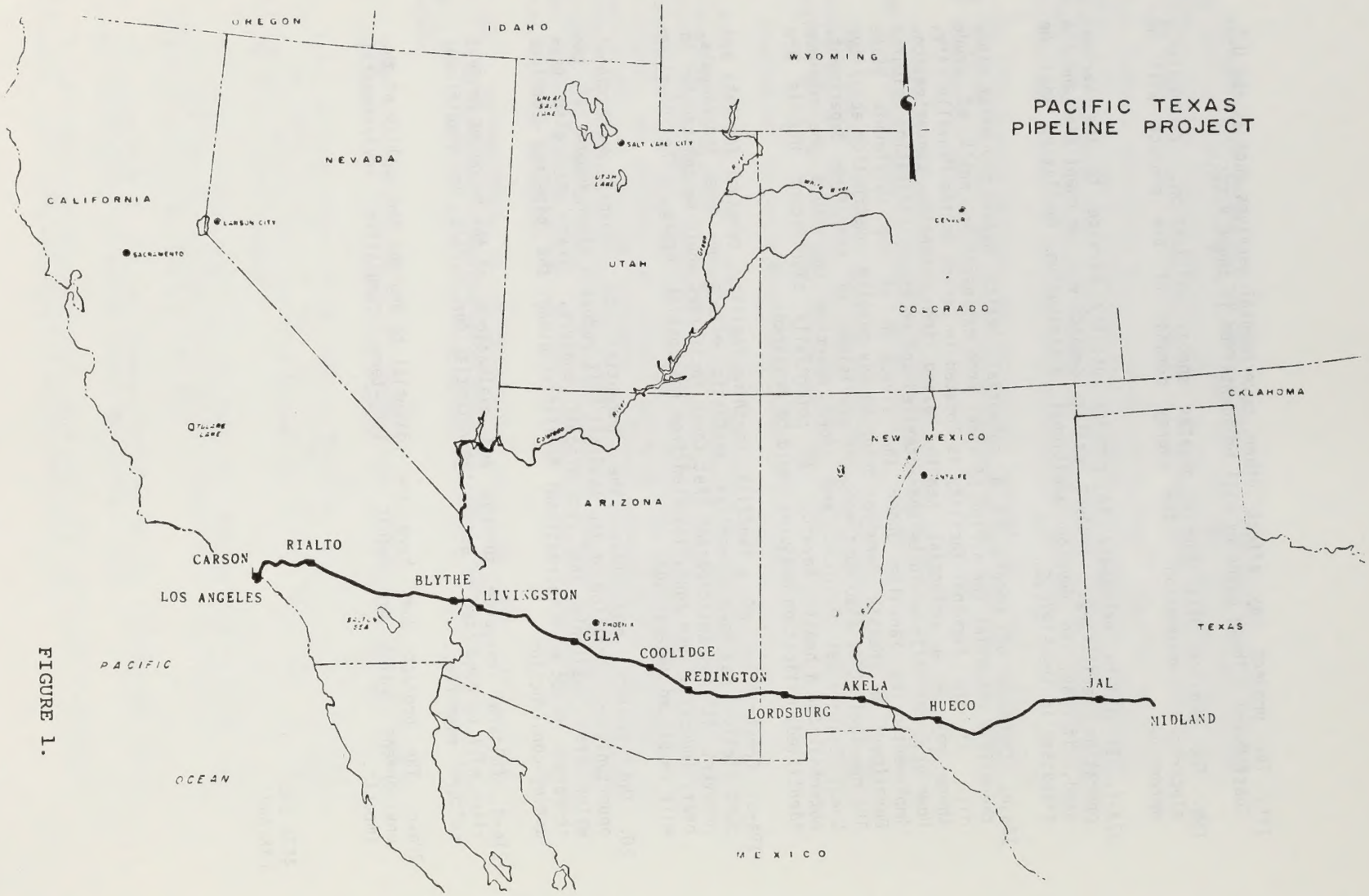
19a-d. Construction of a landfill, berthing facility, terminal facility and pump stations may have a negative aesthetic effect on some individuals. However, it is anticipated that these facilities would be constructed in heavy industrial use zone, isolated from residential areas. The pipeline will be placed underground.

20. The project may have the potential to impact recreational opportunities. Creation of the landfill will reduce a minor amount of the water area available for recreational boaters. There may also be a temporary impact upon recreational facilities along the pipeline corridor during construction.

21a-d. Cultural resource surveys and evaluations of the proposed project sites will be conducted to assess the potential for impact to significant cultural resources.

22a-c. The project does have the potential to degrade the quality of the environment, which may result in long-term cumulative environmental impacts.

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PIPELINE ROUTE OVERVIEW

FIGURE 1.

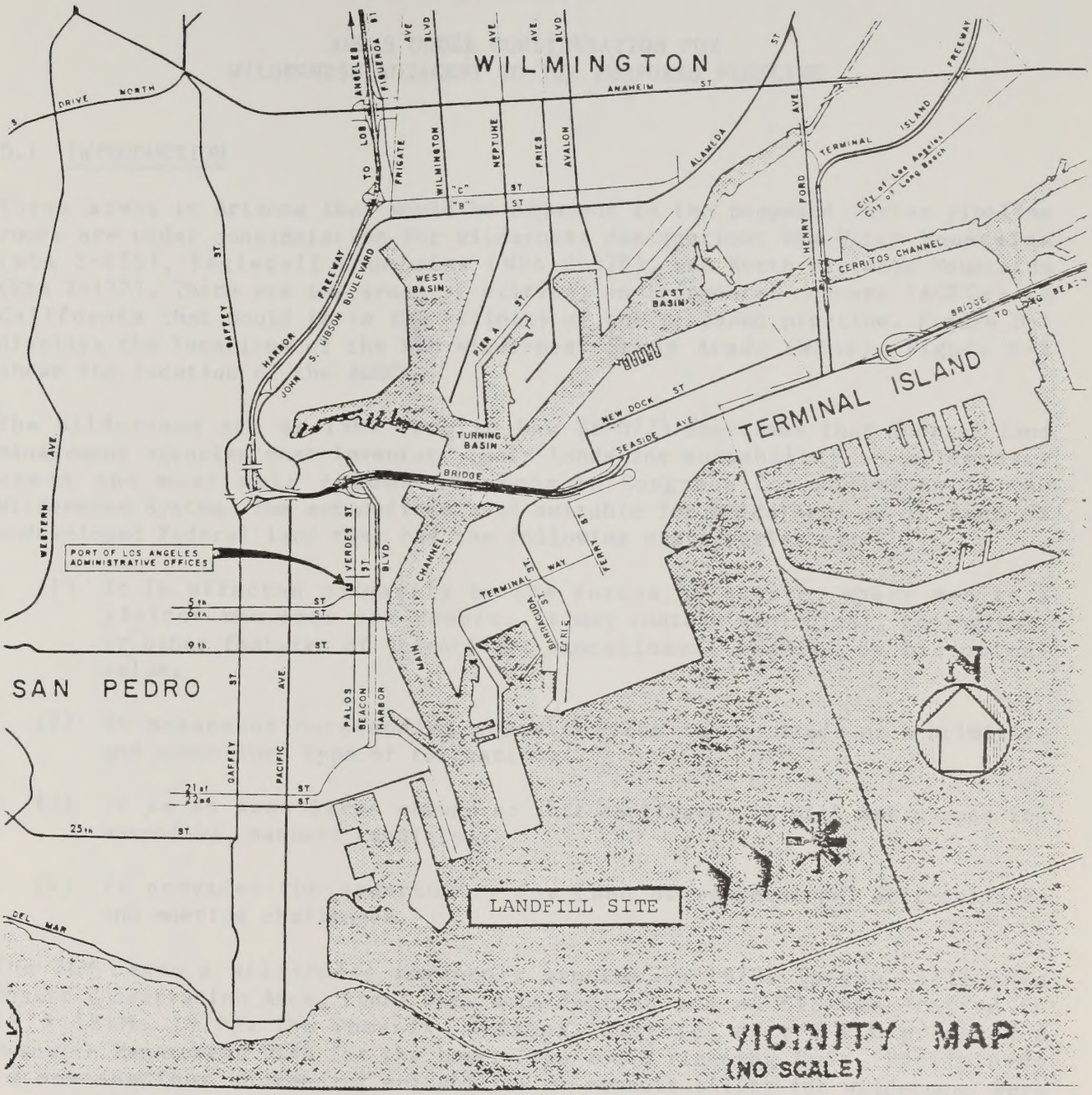

WILMINGTON
ANAHEIM ST
TERMINAL ISLAND FREEWAY
HENRY FORD AVE
ALAMEDA
WILMINGTON AVE
FRIGATE AVE
NEPTUNE AVE
FRIES AVE
AVALON BLVD
"C" ST
"B" ST
CERRITOS CHANNEL
CITY of LOS ANGELES
CITY of LONG BEACH
WEST BASIN
EAST BASIN
PIER A ST
HARBOR FREEWAY
JOHN S. GIBSON BOULEVARD
GAFFEY ST
WESTERN AVE
TURNING BASIN
BRIDGE
NEW DOCK ST
SEASIDE AVE
TERMINAL ISLAND
PORT OF LOS ANGELES ADMINISTRATIVE OFFICES
VERDES ST
BLVD
MAIN CHANNEL
TERMINAL WAY
FERRY ST
BARRACUDA ST
5th ST
6th ST
9th ST
SAN PEDRO
PALOS VERDES
BEACON
HARBOR
PACIFIC AVE
21st ST
22nd ST
25th ST
DEL MAR
LANDFILL SITE
N
VICINITY MAP
(NO SCALE)

FIGURE 2.

APPENDIX D

AREAS UNDER CONSIDERATION FOR WILDERNESS ADJACENT TO THE PROPOSED PIPELINE

D.1 INTRODUCTION

Three areas in Arizona that would be adjacent to the proposed Pactex pipeline route are under consideration for wilderness designation: New Water Mountains (WSA 2-125), Eagletail Mountains (WSA 2-128), and North Maricopa Mountains (WSA 2-157). There are two areas of critical environmental concern (ACECs) in California that would be in the vicinity of the proposed pipeline. Figure D-1 displays the locations of the BLM Wilderness Study Areas (WSAs). Figure D-2 shows the location of the ACECs.

The Wilderness Act of 1964 (Public Law 88-577) specifies that Federal land management agencies must inventory their lands for suitability as wilderness areas and must make recommendations to Congress for additions to the Wilderness System. The act defines land suitable for wilderness as an area of undeveloped Federal land that has the following characteristics:

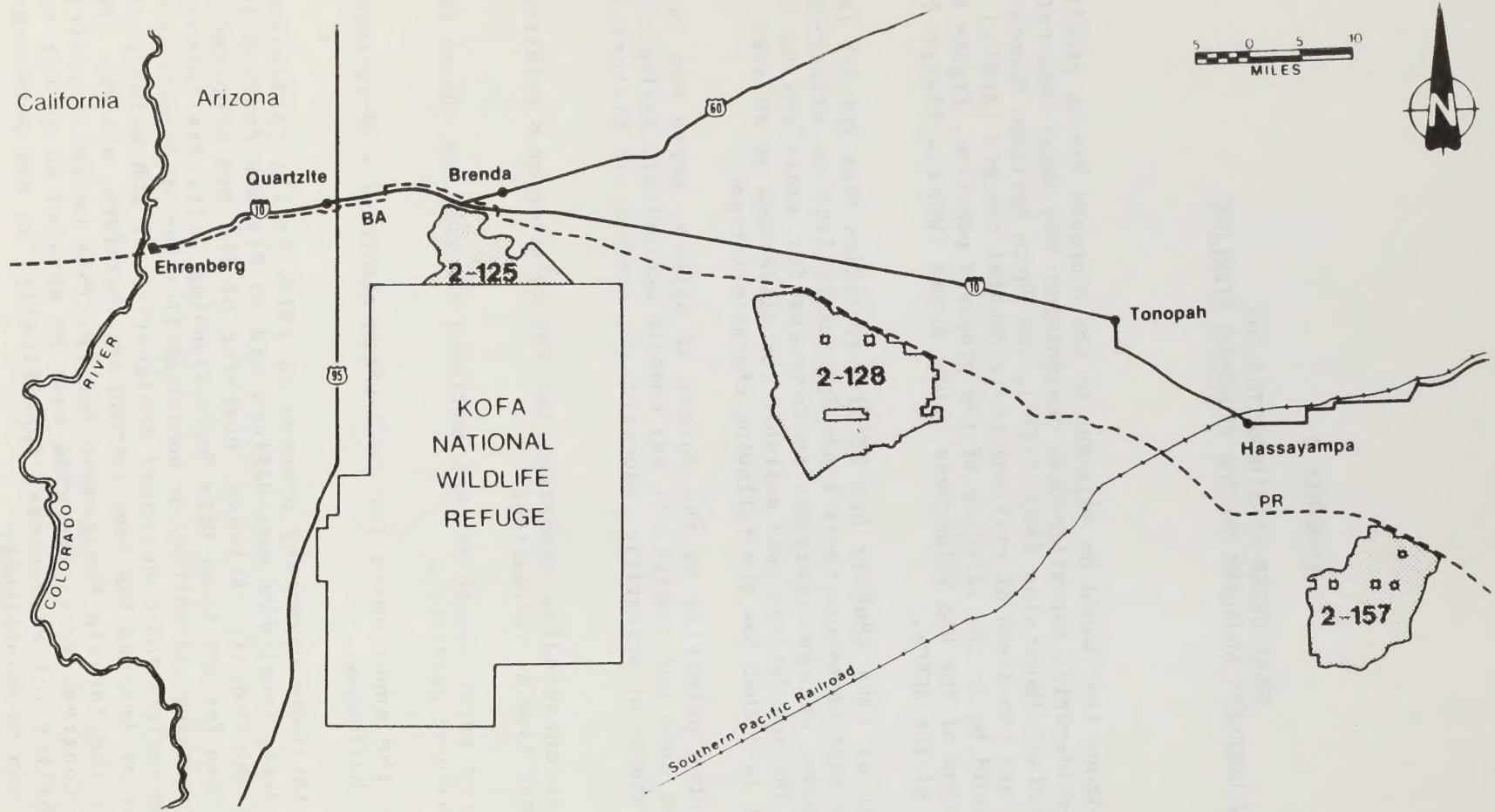
(1) It is affected primarily by the forces of nature, where man is a visitor who does not remain. It may contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

(2) It possesses outstanding opportunities for solitude or a primitive and unconfined type of recreation.

(3) It is an area large enough so that continued use will not change its unspoiled, natural condition.

(4) It provides the opportunity for (and often requires) self-reliance and meeting challenges.

The BLM began a wilderness inventory process in 1978. In the California Desert Conservation Area, final WSAs were defined and an EIS was drafted in 1979 (BLM, 1979). The Phoenix, Arizona, District of the BLM prepared a Resource Management Plan for the Lower Gila South Planning Unit. Preliminary recommendations addressing suitability or nonsuitability for wilderness were part of that plan. No legislation concerning designation of BLM wilderness areas in California or Arizona has been introduced; therefore, all WSAs are being managed under the Interim Management Policy. This national policy states that, until Congress acts, the WSAs must be managed so as not to impair their suitability for wilderness. Specifically, no new permanent rights-of-way (ROWs) can be established.



BLM WILDERNESS STUDY AREAS

2-125 New Water Mountains
2-128 Eagletail Mountains
2-157 Maricopa Mountains

Figure D-1 - Bureau of Land Management Wilderness Study Areas
Adjacent to Proposed Pipeline
(BLM, 1980; ES, 1985)

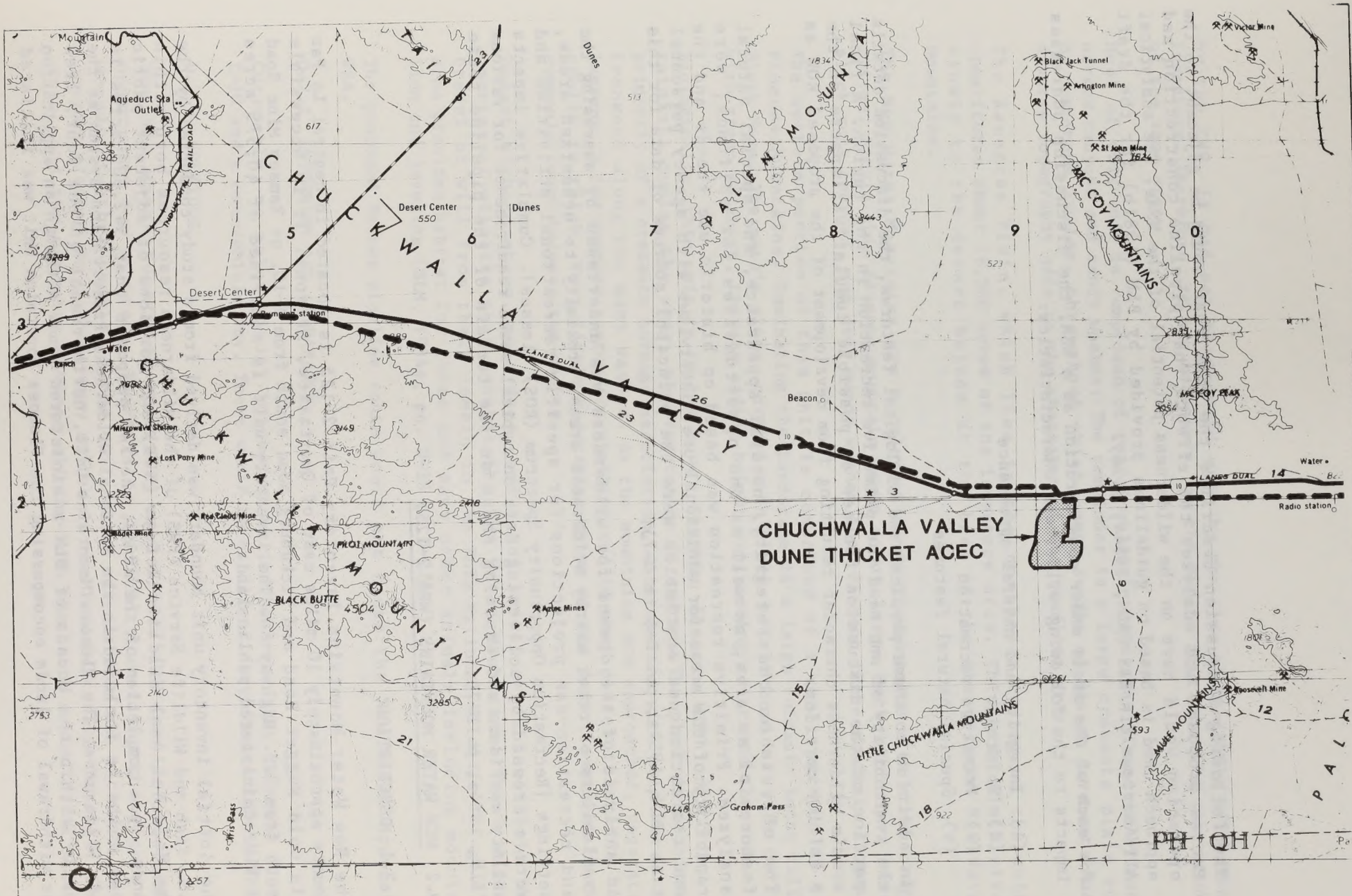


Figure D-2 - BLM Areas of Critical Environmental Concern in Vicinity of Proposed Pipeline
(BLM, 1980; ES, 1985)

The following discussion describes the WSAs that would be adjacent to the Pactex proposal and analyzes the effects that pipeline construction and operation would have on the wilderness potential of the WSAs. The analytical approach used is based on guidelines provided by BLM (1981b) for the draft All-American EIR/EIS (BLM, 1984a, p. 6).

For each of the areas under consideration as a WSA, the discussion addresses impacts to the following wilderness characteristics:

(1) Integrity and natural appearance
(2) Solitude
(3) Primitive recreation
(4) Special natural features

In addition to these physical and biological features, the discussion details the availability of and need for primitive recreation in the region. A final portion of the discussion focuses on possible cumulative impacts on the area's wilderness character resulting from development of the proposed ROW as a utility corridor.

The effects on the integrity, natural appearance, and special natural features of an area, as well as the opportunities for solitude, were analyzed. Primitive recreation was based on historic use trends and the capability of the areas for additional use. Interviews with agency personnel and recreation use statistics were the principal sources of data for this task (BLM, 1984a, pp. D-6 to D-7).

An analysis of the demand for wilderness was undertaken by assessing the availability of other nearby wilderness areas, proximity to urbanized areas, and recreation-use projections for specific recreational activities and settings [Recreation Opportunity Spectrum (ROS) classes]. Cumulative impacts were addressed by collecting data on typical space requirements for various utility corridors and imposing these on the terrain of the pipeline route (BLM, 1984a, p. D-7).

D.2 NEW WATER MOUNTAINS (WSA 2-125)

D.2.1 DESCRIPTION

The New Water Mountains Inventory Unit 2-125 is located in central La Paz County approximately 10 miles east of Quartzsite, Arizona. It is accessible via Gold Nugget Road and Vicksburg Road south from I-10, or Ramsey Mine Road south from U.S. Highway 60. The inventory unit is comprised of 40,375 acres of BLM-administered public land.

The initial inventory unit boundary was derived from a study conducted by the U.S. Fish and Wildlife Service (FWS) of the wilderness resources both within the Kofa National Wildlife Refuge (NWR) and portions of adjacent public lands. Upon completion of the study, the FWS proposed that 542,600 acres in four units be included in the National Wilderness Preservation System as the Kofa Wilderness. The Plomosa Mountains Unit, northernmost of the four, lies mostly within the bounds of BLM-administered land. Although an application for withdrawal of lands encompassing the Plomosa Mountains Unit was initiated

by the FWS, it had not been acted upon by the time of the BLM's wilderness inventory. Therefore, it was necessary for the BLM to initiate its own study of the same area.

Most of this unit is comprised of rugged volcanic mountains dissected by many narrow canyons and sandy washes. The remainder is a large creosote plain cut by numerous swales, throughout which occur swaths of desert pavement. Such diverse topography adds to the character of the roadless area.

The Ranegras Plain, which lies in the northeast corner of the unit, constitutes about 18,500 acres of the inventory area. This wide plain rises slowly to the desert bajada at the base of the steep-faced New Water Mountains.

The New Water Mountains are a colorful range of mountains with steep craggy spires. Within this diverse mountain group occur large rock outcrops, steep slick rock canyons, and deep sandy washes that dissect these mountain slopes.

The western portion of this unit is comprised of a small portion of the Plomosa Mountains. Dominating the landscape is a large volcanic butte called Black Mesa. The mesa's slope, covered with black basalt boulders, is dotted with green saltbush, thereby adding bright contrasting colors to the area.

Biologically, this unit is in the lower Sonoran desert. With only 5 in. of rainfall during the year, the vegetation is sparse. The plant life consists primarily of a creosote bursage association, interspersed with palo verde and ironwood along the many washes. As the mountains are approached, vegetation lessens, a few saguaro cactus are visible, and in many places the teddy bear cholla is thick. Very little vegetation grows on the desert pavement that is commonly found between the washes.

Desert bighorn sheep, mule deer, and feral burros are a few of the many species of wildlife that inhabit the New Water Mountains. These animals travel at will from their domain in the Kofa National Wildlife Refuge. The area provides habitat for these and many other animals including mountain lion and javelina (BLM, 1984a, pp. D-26 to D-27).

The proposed Pactex pipeline route would not cross the New Water Mountains WSA.

D.2.2 INTEGRITY AND APPEARANCE

Currently, no major visual intrusion is in the area other than the distant I-10 and a one-vehicle way. There would be no direct disturbance to the WSA.

D.2.3 SOLITUDE

The New Water Mountains inventory unit offers the user an outstanding opportunity for solitude. There is no difficulty avoiding the sights and sounds of other people in the unit, which extends from the intricate web of canyons winding among the craggy spires in the Twin Peaks and Gunsight Notch area, and the numerous ravines slicing into the earth around Black Mesa, to

the broader valleys in between that display their own complex arrangement of hills and washes. The area could accommodate numerous users before opportunities for solitude would be compromised.

Equipment noise would be noticeable during construction in the WSA. Noise levels of 55 dBA would be audible up to 0.7 mile from the ROW (BLM, 1984a, p. D-27).

D.2.4 PRIMITIVE RECREATION

The New Water Mountains inventory unit of 40,375 acres allows for extended backpacking trips as well as an ideal place for day hikes. The unit is bounded on the south by the Kofa NWR, for which an additional 530,000 acres has been proposed for inclusion in the National Wilderness Preservation System. The two areas combined would allow for a variety of lengthy backpacking trips and would absorb several user groups at a time.

The New Water Mountains are a highly scenic area offering very colorful mountains with steep, slick-walled canyons and sharp prominent ridges offering striking views of the rugged Kofa Mountains. This area, when coupled with the dominant Black Mesa, provides an outstanding opportunity to view and photograph these scenic wonders. The New Water Mountains inventory unit being adjacent to the Kofa NWR affords many opportunities to view, photograph, and hunt the majestic desert bighorn sheep. Such opportunities are truly outstanding since both the New Water Mountains and the Plomosa Mountains are historically lambing areas for the desert bighorn.

Rockhounding in this area is outstanding because of the many historical mining claims. The Arizona Department of Natural Resources has established this area and surrounding country as the "Crystal Mountain Area." It is set aside as an "outstanding rock collecting" area because of the abandoned mines and the mineralized mountains that provide the user with areas to dig for jasper, quartz, and chrysocolla (BLM, 1984a, pp. D-27 to D-28).

D.2.5 SPECIAL NATURAL FEATURES

No unique natural features are within the ROW corridor.

D.2.6 AVAILABILITY AND NEED

There are 30 WSAs under consideration for wilderness designation in the BLM Phoenix District.

D.3 EAGLETAIL MOUNTAINS (WSA 2-128)

D.3.1 DESCRIPTION

The Eagletail Mountains-Cemetery Ridge study area (2-128) encompasses the Eagletail Mountains to the north, Cemetery Ridge to the south, and a desert plain between the two ridges. Elevations in the unit vary between a low of 1,200 ft on the desert plain immediately south of Cemetery Ridge to a high of 3,300 ft at Eagletail Peak. It contains 120,925 acres of BLM land.

Both ridges lie along a northwest to southeast line. The Eagletail topography is highly variable, ranging from a flat or gently undulating landform to one that is strikingly incised and dissected. The north slopes rise abruptly from the desert floor and elevational increases are spectacular. Several different rock strata are visible in most places throughout the Eagletail Mountains. The origin of the parent material in combination with weathering and erosion has created spectacular landforms of natural arches, high spires, monoliths, and jagged sawtooth ridges that drop off almost vertically to the desert floor.

The vegetation of the unit is characteristic of the Sonoran desert type. The lower slopes are dominated by creosote bush, white bursage, ocotillo, and teddy bear cholla while the more heavily vegetated washes are dominated by palo verde, ironwood, smoketree, catclaw, and a few mesquite trees. Vegetation on the steep hillsides include palo verde, barrel cactus, Mormon tea, and saguaro cactus.

Common wildlife in the area includes jackrabbits, coyotes, ground squirrels, great horned owls, numerous raptors, and large coveys of quail. Desert bighorn sheep area also found within the unit (BLM, 1984a, pp. D-23 to D-24).

The Pactex proposed route would lie adjacent to the Eagletail Mountains WSA. Alignment of the ROW is located north and east of the El Paso pipeline and, therefore, would not cross into the WSA.

D.3.2 INTEGRITY AND NATURAL APPEARANCE

There would be no direct disturbance to the WSA.

D.3.3 SOLITUDE

Outstanding opportunities for solitude exist within the Eagletail inventory unit. The dense vegetative cover of the bajadas and desert plains and the dramatic topographic relief of the mountains, coupled with the large size of the area, create ample and outstanding opportunities to avoid the sights and sounds of others within the area (BLM, 1984a, p. D-24).

Noticeable noise impacts would occur during pipeline construction.

D.3.4 PRIMITIVE RECREATION

The diversity of landforms found in the study unit and the size of the area create outstanding opportunities for primitive and unconfined recreation. Within the complex topography of the Eagletail Mountains numerous options for recreation exist, including hiking, photography, and rock climbing. The dramatic cliffs within the unit increase the challenge of the area and the chance of sighting a bighorn sheep spurs a user's interest. The vast size of the desert plain allows a recreationist to walk for hours without signs of human impacts (BLM, 1984a, p. D-24).

D.3.5 AVAILABILITY AND NEED

Opportunities for primitive recreation are discussed in the New Water Mountains analysis.

D.4 NORTH MARICOPA MOUNTAINS (WSA 2-157)

D.4.1 DESCRIPTION

The North Maricopa Mountains inventory unit is located along the northern extent of the Maricopa Mountains, approximately 12 miles northeast of Gila Bend. It contains 75,485 acres.

The unit is bounded by a 230-kV powerline for half its western boundary, by a gas pipeline on its northern boundary, and roads for the remaining boundary, including the historical Butterfield Stage Route running along 6 miles of the unit's southeast portion. The North Maricopa Mountains inventory unit contains a 10-mile-long portion of the Maricopa Mountains as well as extensive portions of the surrounding desert plain. The higher mountains in this part of the Maricopa Range rise between 1,000 and 1,700 ft off the desert floor, with the highest peak in the unit being 2,813 ft in elevation. The mountains trend northwest to southeast. Their arrangement provides a high degree of topographic complexity.

Several wide valleys are interspersed with the mountains in the unit. In the northeastern portion, a 3.5-mile valley separates a small mountain range from the rest of the unit. Valleys narrowing into canyons extend into the center of the area from all sides.

The western and southwestern portions of the unit include as much as 5 miles of desert plain radiating out from the mountains. This plain is dissected by countless washes, some of which are quite sizable and display a wide diversity of vegetation. The vegetation in the area is varied, but consists primarily of a palo verde-saguaro community with creosote, mesquite, and some dense stands of cholla. Ironwood is common in the drainages.

Among other species, this area provides habitat for coyotes, bobcat, fox, deer, many jackrabbits, and perhaps cougar. Raptors are numerous, as are Gambel's quail (BLM, 1984, p. D-25).

Pactex's proposed ROW would lie adjacent to approximately 10 miles of the northeastern boundary of the North Maricopa Mountains WSA. Routing of the pipeline would locate it on the northern side of the existing El Paso pipeline ROW outside of the WSA, but usually within 250 ft of its boundary. Potential impacts to the WSA, therefore, would be limited to indirect effects such as visual change and noise from construction.

D.4.2 SOLITUDE

Outstanding opportunities for solitude are present throughout much of the North Maricopa Mountains inventory unit. Approximately two-thirds of this unit comprises the Maricopa Mountains themselves. The mountains present a complex topography of peaks, hills, canyons, valleys, and washes. The mountains are not so rugged as to concentrate use, yet they present the sense of wildness and challenge usually associated with a mountainous area.

The most noticeable noise effects from pipeline construction would last approximately 1 week (assuming a 2-mile-per-day construction rate plus ROW preparation time) (BLM, 1984, p. D-25).

D.4.3 PRIMITIVE RECREATION

The size of the unit, 10 by 12 miles, allows for extended camping and hiking trips as well as day use. The complexity of the topography in this area creates many "hidden" and isolated places that invite exploration. The diversity of topography ensures that primitive recreation opportunities are available for many users or user parties without a loss of a sense of unconfinement.

D.5 CHUCKWALLA VALLEY DUNE THICKET

The Chuckwalla Valley Dune Thicket (CVDT) was designated as an ACEC in the California Desert Plan (BLM, 1980). It is described in the Chuckwalla Valley Dune Thicket ACEC Management Plan (1982) as follows.

The Chuckwalla Valley Dune Thicket was proposed exclusively as a wildlife ACEC. The thickets are relatively small pockets of dense microphyll woodland vegetation ranging in size from 0.25 acre to 6 acres. The dense vegetation results from the confluence of a wash draining the north side of the Little Chuckwalla Mountains and a small dune system approximately 2 miles in length. Water collects along the eastern edge of the sand dunes and supports the flush of vegetation. It is believed that the dune thicket is supported solely by runoff that collects in the dune complex.

The dominant plants of the thicket are large palo verde trees (Cercidium floridium) with a few scattered ironwood trees (Olneya tesota). Mesquite is present but is not a dominant component of the thicket. Creosote bushes near the thicket are very large; heights up to 10 ft are not uncommon. No rare or endangered plants were found within the ACEC.

The dense vegetation is attractive to both migrant and breeding birds as well as large numbers of birds that forage in the area during the winter. Studies of the avifauna have revealed that numerous species breed in this location, including Wied's crested flycatcher, a bird rarely breeding in the desert. Numbers of wintering and breeding bird species are comparable to those of desert washes that support some of the greatest diversities in the desert. The dune thicket is especially outstanding in the densities of wintering birds found here. A density of 3,425 wintering birds/100 acres was recorded during the Desert Plan inventory. This was by far the highest density recorded on any of the census plots in the desert. Forty-three species were recorded during this survey. About 90% of the birds observed were composed of five granivorous or seed-eating species: white-crowned sparrow, Brewer's sparrow, house finch, Gambel's quail, and Savannah sparrow. Eleven species of raptors were also observed, including marsh hawk, merlin, and ferruginous hawk.

The ACEC provides a variety of habitats for reptiles and mammals. These dunes, like others throughout the California desert, provide islands of habitat for very specialized animal species. For example, Mojave fringe-toed lizards (Uma scoparia), which are completely restricted to dune habitat, have been recorded here very near the southern limit of their range. Also, the desert kangaroo rat (Dipodomys deserti) and kit fox (Vulpes macrotis arsipus) are closely associated with dune habitats. Several

active kit fox dens have been seen near the base of the dunes, and desert kangaroo rat burrows are abundant on the dunes. Round-tail ground squirrels (Citellus tereticaudus) are also probably present in the sandy areas of the ACEC.

The palo verde woodland provides shelter and browse for burro deer (Odecoilus hemionus eremicus), which use the thicket intermittently. Larger carnivores including coyote (Canis latrans mearnsi), gray fox (Urocyon cinereoargenteus scottii), bobcat (Lynx rufus baileyi), and badger (Taxidea taxus berlandieri) utilize areas such as the thicket regularly, taking advantage of abundant prey species such as Audubon cottontail (Sylvilagus audubonii arizonae), desert wood rat (Neotoma lepida), and various species of pocket mice (Perognathus sp.).

Although the species mentioned above are not uncommon in the lower Sonoran desert, the diversity of habitats in this ACEC provides a unique mix of species in a very small area.

The proposed route would cross the northeasternmost tip of the ACEC but would not impact the designated thicket area.

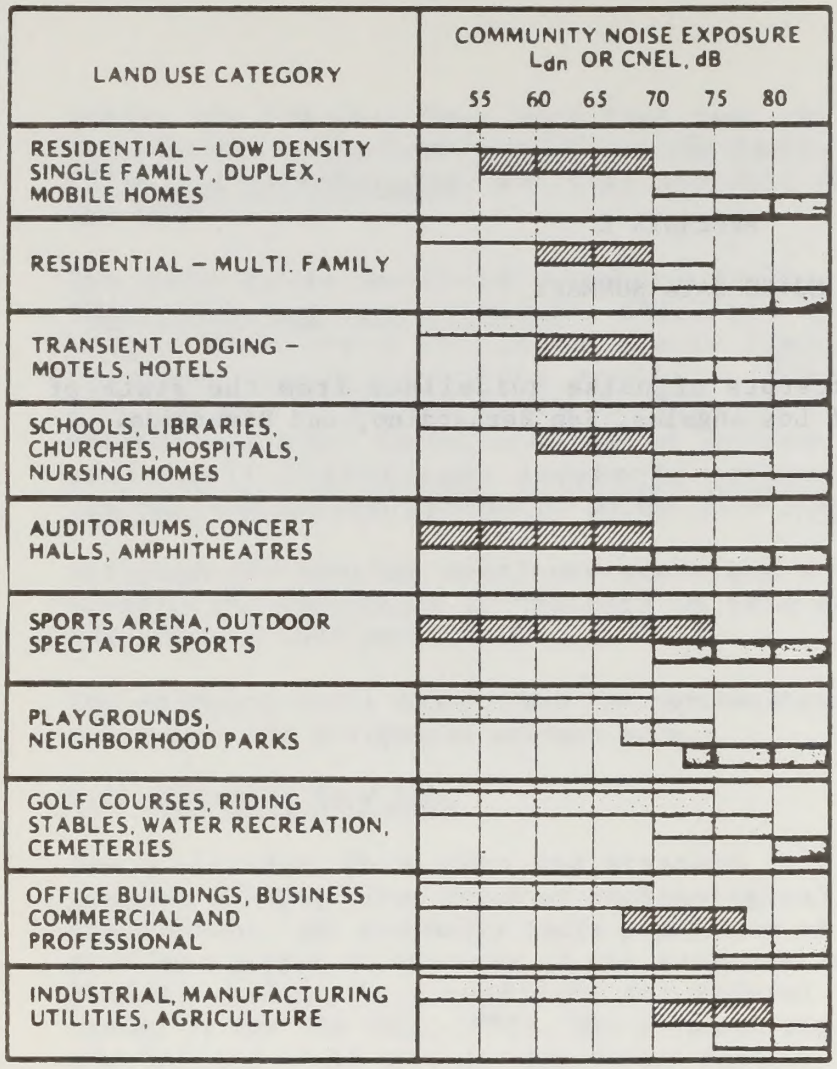
D.6 ALLIGATOR ROCK ACEC

The Alligator Rock area was proposed for ACEC designation in order to preserve a significant group of archaeological sites and their surrounding environment. An unusually large population of a sensitive cactus species has also been mapped in the area of the proposed ACEC. The species, Alverson's foxtail cactus, is a candidate for federal listing currently under status review by the FWS (BLM, 1983). The proposed pipeline would not cross the ACEC boundary and would have no significant impact.

APPENDIX E

NOISE DATA SUMMARY

This appendix provides excerpts of noise guidelines from the state of California and the counties of Los Angeles, San Bernardino, and Riverside.



INTERPRETATION

NORMALLY ACCEPTABLE

Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

NORMALLY UNACCEPTABLE

New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE

New construction or development should generally not be undertaken.

CONSIDERATIONS IN DETERMINATION OF NOISE-COMPATIBLE LAND USE

A. NORMALIZED NOISE EXPOSURE INFORMATION DESIRED

Where sufficient data exists, evaluate land use suitability with respect to a "normalized" value of CNEL or L_{dn}. Normalized values are obtained by adding or subtracting the constants described in Table 1 to the measured or calculated value of CNEL or L_{dn}.

B. NOISE SOURCE CHARACTERISTICS

The land use-noise compatibility recommendations should be viewed in relation to the specific source of the noise. For example, aircraft and railroad noise is normally made up of higher single noise events than auto traffic but occurs less frequently. Therefore, different sources yielding the same composite noise exposure do not necessarily create the same noise environment. The State Aeronautics Act uses 65 dB CNEL as the criterion which airports must eventually meet to protect existing residential communities from unacceptable exposure to aircraft noise. In order to facilitate the purposes of the Act, one of which is to encourage land uses compatible with the 65 dB CNEL criterion wherever possible, and in order to facilitate the ability of airports to comply with the Act, residential uses located in Community Noise Exposure Areas greater than 65 dB should be discouraged and considered located within normally unacceptable areas.

C. SUITABLE INTERIOR ENVIRONMENTS

One objective of locating residential units relative to a known noise source is to maintain a suitable interior noise environment at no greater than 45 dB CNEL or L_{dn}. This requirement, coupled with the measured or calculated noise reduction performance of the type of structure under consideration, should govern the minimum acceptable distance to a noise source.

D. ACCEPTABLE OUTDOOR ENVIRONMENTS

Another consideration, which in some communities is an overriding factor, is the desire for an acceptable outdoor noise environment. When this is the case, more restrictive standards for land use compatibility, typically below the maximum considered "normally acceptable" for that land use category, may be appropriate.

Figure E-1 - California Office of Noise Control Land Use Compatibility for Community Noise Environments (BLM, 1984a, p. F-2)

VI. STATEMENT OF POLICIES

The following policies provide direction for the achievement of element goals. They will be carried out through implementation programs utilizing public and private resources.

In the process of formulating policy content, several alternative policy sets were considered. These alternatives reflected various courses of action. From this, a preferred policy set was selected based on its effectiveness in achieving the goals set forth, as well as its social, political, and economic feasibility.

It is the policy of Los Angeles County to:

1. Promote the necessary organizational adjustments within county government to establish a central authority which identifies technological opportunities, conducts studies, assesses effectiveness of programs, sets standards, and recommends transportation noise mitigation techniques, programs, and alternatives.

2. Determine and evaluate the present and future noise levels associated with all major transportation facilities in the county.

3. Establish acceptable noise standards consistent with health and quality of life goals and employ effective techniques of noise abatement through such means as building code, noise, subdivision, and zoning ordinances.

4. Reduce the present and future impact of excessive noise from transportation sources through judicious use of technology, planning, and regulatory measures.

5. Establish noise criteria in the specifications for purchase of vehicles, aircraft, and their components intended for use by the county, including all equipment needed for maintenance and repair of such vehicles and aircraft.

6. Promote increased public awareness concerning the effects of noise.

7. Encourage cities to adopt definitive noise ordinances and policies that are consistent throughout the county.

8. Coordinate with, and assist, the various cities in dealing with the problem of noise and provide leadership and technical expertise when requested by other jurisdictions.

9. Coordinate with federal, state, and city governments in developing and implementing noise abatement programs.

10. Seek funds from the appropriate levels of government to underwrite the costs of noise abatement programs.

Figure E-2 - Los Angeles County Noise Policies
(Los Angeles County Noise Element, 1974)

11. Monitor the programs and policies of the responsible special districts, regional, state, and federal agencies in order to insure that they effectively exercise their mandate to control the sources of noise for new, proposed, or existing transportation facilities, vehicles, or aircraft.

12. Encourage the state Department of Transportation to conduct an active highway noise abatement program with scenic/esthetic considerations.

13. Urge continued federal and state research into the noise problem and recommend additional research programs as problems are identified.

14. Recommend needed legislation to the state and federal government which will provide for noise abatement and the distribution of the costs of noise abatement programs among the producers of noise.

15. Encourage the federal and state governments and other agencies to work for standardization and simplification of the measurement methods used in assessing noise impact.

Figure E-2 (Contd)

Insensitive Land Uses (1)	Moderately Sensitive Land Uses (2)	Sensitive Land Uses (3)	Very Sensitive Land Uses (4)
Land-Use Category by Major Land-Use Activity			
Agriculture	Cemeteries	Single-Family (Detached) Dwellings	Single-Family (Detached) (dwelling rural)
Forestry	Country Clubs	Single-Family (Attached) Dwellings	Educational Facilities
Mining and Extraction	Athletic Clubs	Multi-Family (Low-Rise) Dwellings	Hospitals
Natural Open Space	Tennis Clubs	Multi-Family (Mid-Rise) Dwellings	Convalescent Homes
Undeveloped Land	Equestrian Clubs	Multi-Family (High-Rise) Dwellings	Theaters
Railways and Terminals	Scientific Testing	Dormitories	Wildlife Sanctuaries
Transit Systems and Terminals	Professional Research	Resort Hotels	Churches
Auto Parking	Government Services	Outpatient Clinics	Mobile Home Parks
Raceways and Drag Strips	Lodges, Community Associations	Preschools	
Motorcycle Parks	Restaurants and Bars	Motor Inns	
Rifle Ranges	General Merchandising	Hotels	
Reclamation Projects	Professional Offices	Recreation Vehicle Parks	
Liquid and Solid Waste Facilities	Horticulture		
Industrial Manufacturing	Livestock Farms		
Warehousing Utilities	Fishery		
Wrecking and Salvage Yards	Water Areas		
Construction Yards			

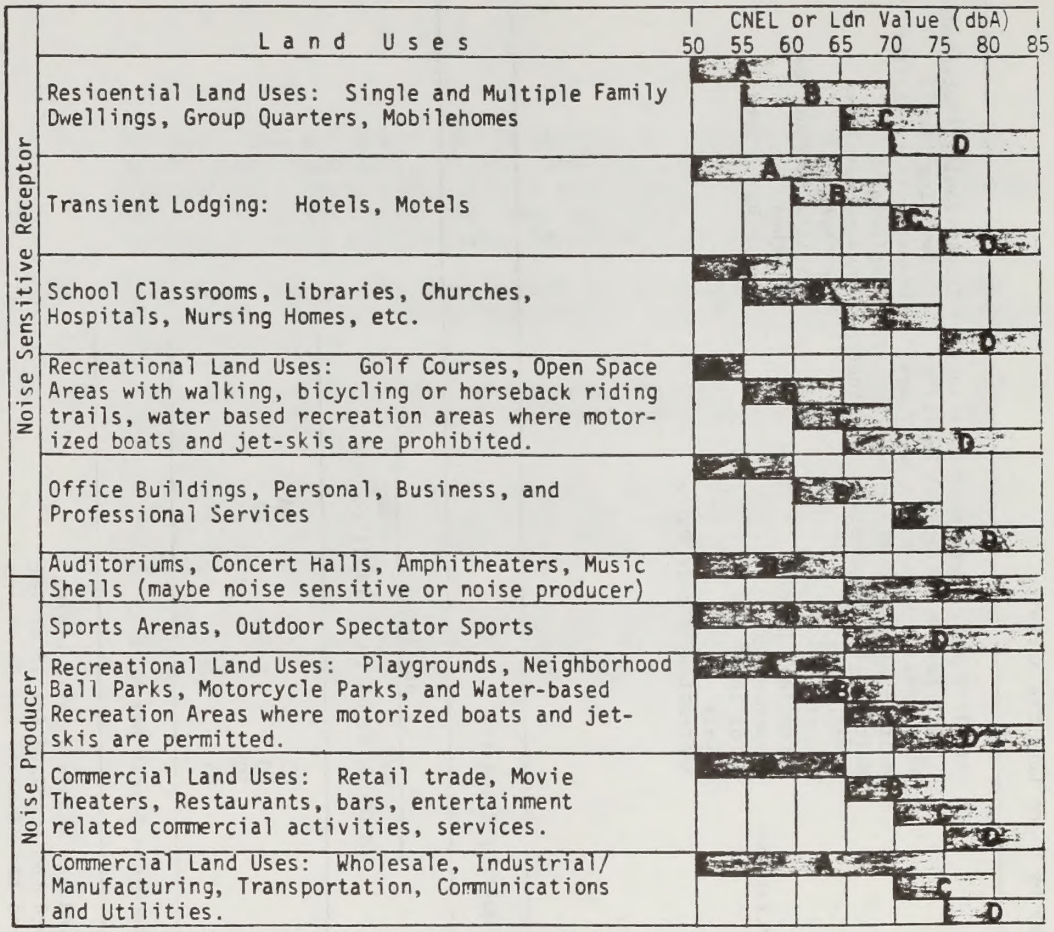
Noise Quality Standards

Land-Use Category	dBA Level Day (0701 to 2200)	dBA Level Day (2201 to 0700)
(1) Insensitive	65	NA
(2) Moderately Sensitive	60	NA
(3) Sensitive	50	45
(4) Very Sensitive	45	40

Permissible Exceeded Levels per Hour

5 dBA = May exceed the standard for 6 min/hr
10 dBA = May exceed the standard for 15 min/hr
15 dBA = May exceed the standard for 36 sec/hr

Figure E-3 - San Bernardino County Noise Quality Standards
(San Bernardino County Noise Element, no date)



Explanation of Land Use Consequences:

A Normally Acceptable. With no special noise reduction requirements assuming standard construction.

B Conditionally Acceptable. New construction or development should be undertaken only after a detailed analysis of the noise reduction requirement is made and needed noise insulation features included in the design.

C Generally Unacceptable. New construction is discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

D Land Use Discouraged. New construction or development should generally not be undertaken.

Figure E-4 - Riverside County Land-Use Compatibility Chart for Community Noise
(Riverside County Comprehensive General Plan, 1984)

APPENDIX F

ECONOMIC SUPPLY AND DEMAND FOR THE PIPELINE PROJECT

F.1 INTRODUCTION

The purpose of the proposed Pactex Pipeline System is to transport surplus crude from the U.S. West Coast Petroleum Administration for Defense District (PADD) V (see Figure F-1) to crude oil deficient PADDs I-IV via connecting carriers in the Midland, Texas, area. This analysis is intended to quantify the existing PADD V crude oil surplus and present projections of future PADD V crude oil demand and supply.

F.2 PRESENT AND PROJECTED CRUDE OIL SUPPLY AND DEMAND

The following subsections focus on the present and future crude oil outlook from the national perspective; a similar evaluation is given of PADD V.

F.2.1 THE NATIONAL OUTLOOK

The following discussion on the national crude oil demand/supply situation reflects the position of the Energy Information Administration (EIA) as presented in its Annual Energy Outlook, 1984. The U.S. supply of crude oil is forecast by EIA to increase from the projected 1985 level of 12.3 million barrels per day (bpd) to 13.4 million bpd in 1990, and to 13.7 bpd in 1995 as shown in Table F-1. This increase represents an annual increase in crude oil supply of 1.7% for the 1985-1990 period and an annual increase of 0.4% for the 1990-1995 period.

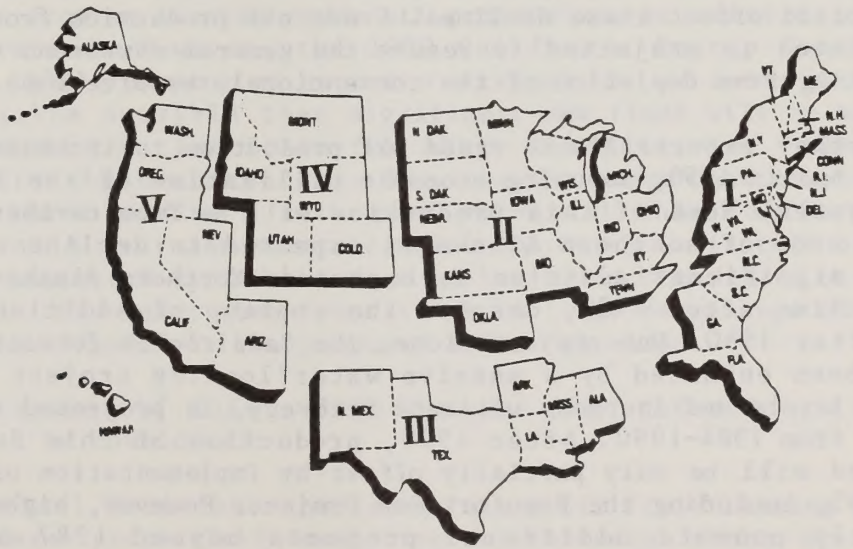


Figure F-1 - Petroleum Administration for Defense Districts
(U.S. Energy Information Administration)

Table F-1 - U.S. Crude Oil Supply by Source
(million bpd)

Source	1985	1990	1995
Lower 48 states - onshore	6.0	5.1	5.3
Outer continental shelf	1.2	1.1	0.7
Alaska North Slope	1.7	2.1	1.2
Net imports	3.4	5.1	6.5
Total	12.3	13.4	13.7
Average annual increase:		1985 to 1990 = 1.7%	
		1990 to 1995 = 0.4%	

Source: Energy Information Administration, Office of Energy Markets and End Use; U.S. Department of Energy; "Annual Energy Outlook 1984, DOE/EIA - 0383 (84)," January 1985.

Domestic crude oil production sources, i.e., lower 48 state onshore production, outer continental shelf (OCS) production, and Alaska North Slope production, are expected to evidence lower levels in 1995 than in 1985, while imports are expected to increase substantially over the 1985 level. The likely continuation of relatively stable oil prices will cause domestic production declines through 1995, although enhanced oil recovery (EOR) is expected to do well. The EIA projects oil production from OCS will peak between 1986 and 1988 and then decline slowly, while Alaskan production is projected to decline after a peak in 1990. The EOR effect is not projected to be sufficient to offset these declines. Crude oil production from the onshore lower 48 states is projected to resume the general downtrend of the last 15 years resulting from depletion of the conventional resource base.

The EIA further expects Alaska crude oil production to increase to a peak of 2.1 million bpd in 1990, assuming economic utilization of the Trans-Alaskan Pipeline System. Most of this production will be from northern Alaska. The Cook Inlet area of southern Alaska is expected to decline continuously, because no significant addition is expected. Northern Alaska production is seen to decline after 1990, despite the startup of additional recovery projects after 1990. One project alone, the Saddlrochit formation, which has currently been enhanced by a massive waterflooding project to maintain production levels and increase ultimate recovery, is projected to produce 1.5 million bpd from 1984-1990. After 1990, production of this formation will fall off and will be only partially offset by implementation of new projects prior to 1995, including the Beaufort Sea Project. However, higher oil prices would likely promote additional projects beyond 1987 not presently anticipated.

EOR in the lower 48 states is expected to contribute large amounts of crude oil production through 1995. EOR is the incremental oil reserve that can be economically produced from a petroleum reservoir over that which can be economically recovered by conventional methods. The National Petroleum Council (NPC) states that EOR volumes are currently in excess of 500,000 bpd and should reach the 1 million bpd level in the 1990s. The DOE projects crude oil production from the lower 48 states to peak during the 1986-1988 period at 1.3 million bpd. Decline will follow in the offshore lower 48 states' production as production in the Gulf of Mexico decreases. Pacific OCS oil production is projected to increase to more than 300,000 bpd by 1990. Faster development will be deterred by relatively low world oil prices, leasing constraints, and the long-lead times required to implement production plans. The rise in California OCS production in recent years reflects very high levels of exploratory drilling early in the 1980s, resulting from substantial increases in crude oil prices.

F.2.2 PADD V OUTLOOK

PADD V refinery input in 1984 amounted to 2,214,400 bpd compared to total crude oil production of 2,860,200 bpd. A crude oil surplus of 645,800 bpd resulted. Crude oil imports averaging 202,400 bpd further increased this surplus to 848,200 bpd. This PADD V surplus of crude oil continues the trend of the last several years, reflecting a surplus between 800,000 and 900,000 bpd (EIA, 1984).

Most of the existing crude oil surplus in the district is attributable to Alaskan production. Of the current Alaskan production level of over 1.6 million bpd, nearly 850,000 bpd are in excess of west coast needs and are being shipped either through the Panama Canal to the gulf coast or around Cape Horn to refineries in the Caribbean. The volume of crude oil transshipped is generally expected to remain at similar levels until the early 1990s when the Prudhoe Bay field will show decreasing production levels. Some sources predict a decline in Alaska production, while others project a continuation of the existing levels. The EIA, for example, projects a significant drop in Alaskan crude oil production as existing reserves are largely extracted. However, the 1982 California Energy Commission (CEC) report (CEC, 1982) focusing on export restrictions on domestic oil, stated that it is quite possible that significant new finds will be made in Alaska that could extend the time frame for large interdistrict PADD V crude oil shipments into the next century. Even in the event that Alaskan production should fall, there is also a very good potential that California offshore production could increase substantially. The heavy California offshore crude oil can be transported by unheated pipeline when blended with the lighter Alaskan crude oil. Under these conditions, a large percentage of the offshore crude could be shipped via the proposed Pactex pipeline.

In any assessment of future PADD V crude oil production, the following variables must be considered:

(1) Political decisions involving future oil field leasing arrangements. New lease proposals in sensitive environmental areas are currently a volatile issue.

(2) Future air quality standards that will affect how much California heavy oil can be produced and consumed.

(3) Tax changes, e.g., the imposition of a severance tax in California or changes in the windfall profits tax, currently set to expire in 1991.

(4) The future price of oil.

(5) The availability of complex refinery capacity to convert the heavy PADD V crude slate into an appropriate product slate. This will depend heavily on changes in the petroleum demand and on the type of slate demanded.

(6) The level of national economic growth.

(7) The potential of accidential or unpredictable disruptions in the world oil system that could dramatically affect crude oil prices.

(8) The success of exploration efforts in PADD V.

(9) Continuation of the export ban on domestically produced oil.

The results of two relatively recent PADD V crude oil forecasts are shown to indicate a range in future crude oil surpluses. One forecast was prepared by Purvin & Gertz for the Resource Management Department of Santa Barbara County, California (Purvin & Gertz, 1983); the other forecast was prepared by Dames & Moore for the Division of Petroleum Revenue, State of Alaska (Dames & Moore, 1982). Both forecasts project a continuing surplus in PADD V through the year 2000. Supply forecasts derived from the two reports are summarized in Table F-2; total supply/demand projections are given in Table F-3. Total crude oil demand forecasts (Table F-3) are reasonably similar, particularly for the years 1995 and 2000. Differences in the supply forecast, however, produce crude oil surplus projections that indicate significant differences by the year 2000. This is attributable to the inclusion in the Dames & Moore figures of planned and potential new Alaskan production sources. Projections for the PADD V crude oil surplus in the year 2000 range from 470,000 bpd (for Purvin & Gertz) to 1,300,000 bpd (for Dames & Moore).

As mentioned earlier, numerous factors will ultimately determine the extent of PADD V's future crude oil surplus. The most critical factor governing the development of additional production capacity in Alaska and California will probably be the price of oil. A significant increase in oil prices would ensure a crude oil surplus in the higher range of the forecasts presented. Lower prices or the removal of the export ban on domestically produced oil would produce surpluses of lower magnitudes.

F.3 COMPARATIVE PIPELINE AND TANKER CRUDE OIL TRANSPORTATION COSTS

Table F-4 presents crude oil transportation costs in terms of dollars per barrel abstracted from a CEC report (CEC, 1982). The table indicates that the cost of ocean carriage by tanker from Los Angeles to the gulf coast should be $2.50 to $3.50 per barrel. The $2.50/barrel figure is appliable to tankers of less than 70,000 dwt that are capable of transiting the Panama Canal. The

Table F-2 - Comparative West Coast Oil Supply Forecasts
(million bpd)

Item	Forecast Year 1985	1990	1995	2000
California Onshore Production				
Purvin & Gertz	0.890	0.820	0.730	0.630
Dames & Moore	0.900	0.900	0.850	0.850
California Offshore Production				
Purvin & Gertz	0.120	0.420	0.560	0.440
Dames & Moore	0.300	0.700	0.500	0.500
Imports/Other				
Purvin & Gertz	0.050	0.050	0.050	0.050
Dames & Moore	0.350	0.300	0.300	0.300
Alaskan North Slope				
Purvin & Gertz	1.800	1.860	1.600	1.600
Dames & Moore[a]	1.750	1.850	2.050	1.950
Total Crude Oil Supply				
Purvin & Gertz	2.860	3.150	2.940	2.720
Dames & Moore	3.300	3.750	3.700	3.600

[a]Includes existing, planned, and potential Alaska production.
Note: Dames & Moore figures derived from figure given in the Oil and Gas Journal, March 28, 1983, p. 41.
Source: Purvin & Gertz, Inc., 1983; Dames & Moore, Inc., 1983.

$2.50/barrel figure represents the use of larger tankers that offload to use the Trans-Panama Pipeline. Most of the Alaskan crude is currently being transported by tankers too large to transit the Panama Canal. Therefore, the $2.50 figure is more applicable for comparison purposes. The future Pactex pipeline tariff rates are expected to be between $1.75 to $2.25 per barrel. The pipeline cost advantage is therefore in the range of $0.25 to $0.75 per barrel based on the information presented. It should be noted that these savings result from the much shorter distance that would be traversed by the Pactex pipeline, i.e., 1,031 miles versus 4,425 miles by tanker from POLA to the gulf coast. If the tankers operate empty for half of the round-trip journey, the actual mileage applicable to delivery of the crude oil would be 8,850 miles.

Table F-3 - Total Comparative West Coast Oil Surplus Forecasts
(million bpd)

Item	Forecast Year 1985	1990	1995	2000
Supply Forecasts				
Purvin & Gertz	2.860	3.150	2.940	2.720
Dames & Moore	3.300	3.750	3.700	3.600
Demand Forecasts				
Purvin & Gertz	2.070	2.090	2.170	2.250
Dames & Moore	2.500	2.400	2.300	2.300
Surplus				
Purvin & Gertz	0.790	1.060	0.770	0.470
Dames & Moore	0.800	1.350	1.400	1.300

Source: Purvin & Gertz, Inc., 1983; Dames & Moore, Inc., 1983.

Table F-4 - Crude Oil Transportation Costs

Route	Miles	$/barrel
Valdez-gulf coast via Panama Canal	6,625	5.00
Valdez-gulf coast via Panama pipeline	6,625	4.00
Valdez-Los Angeles	2,200	1.50
Los Angeles-gulf coast via Panama pipeline	4,425	2.50
Pactex pipeline	3,010	1.75 - 2.25[a]

[a]Preliminary estimate.
Source: California Energy Commission, Export Restrictions on Domestic Oil - A California Perspective, November 1982. Los Angeles-gulf coast figures by Engineering-Science.

Because of the many variables involved in the comparison of pipeline and tanker transport costs (investment, rate of return, age of equipment), it is difficult to accurately ascertain the actual savings of one mode versus the other. The purpose of this analysis is to demonstrate that the proposed Pactex pipeline is competitive with marine transportation in terms of cost.

APPENDIX G

OIL SPILL CONTINGENCY PLAN OUTLINE

The purpose of the Pactex Oil Spill Contingency Plan (OSCP) would be to delineate the equipment and operational procedures used by the spill response team to prevent, report, and contain oil spills and the subsequent restoration activities performed onshore and offshore. The overall philosophy of the plan would be to prevent spills through project design and operation procedures and by training personnel to contain and mitigate spill impacts if one should occur. The plan would be updated regularly and reviewed through the identification of more effective equipment and response procedures. An outline and guidelines for preparation of the OSCP are in this appendix.

The facilities proposed by Pactex would require compliance with state and Federal regulations for crude oil-handling facilities. These would include the following regulations:

(1) U.S. Environmental Protection Agency

(a) 40 CFR 109, Criteria for State, Local, and Regional Oil Removal Contingency Plans

(b) 40 CFR 110, Discharge of Oil

(c) 40 CFR 112, Oil Pollution Prevention (Spill Prevention Control and Countermeasure Plans)

(2) U.S. Coast Guard

(a) 33 CFR 126, Handling of Explosives or other Dangerous Cargoes Within or Contiguous to Waterfront Facilities

(b) 33 CFR 151 and 158, Reception Facilities; Proposed Rule

(c) 33 CFR 154, Large Oil Transfer Facilities (Requirements for Operations Manual; equipment requirements for discharge containment, emergency shutdown, and facility operation - printed at the end of this appendix.)

(d) 33 CFR 156, Oil Transfer Operations

(3) U.S. Department of Transportation

(a) 49 CFR 195.402, Procedural Manual for Operations, Maintenance, and Emergencies (pipeline systems)

(4) American National Standards Institute/American Society of Mechanical Engineers

(a) ANSI/ASME B-31.4-1979, Liquid Petroleum Transportation Piping Systems (Preparation of Emergency Plans)

(5) Los Angeles Municipal Code, Division 95

(a) Marine Oil Terminals, Tank Vessels, and Barges

(b) Port of Los Angeles, Tariff 3, Handling Petroleum Products

The purpose of the Pactex OSCP is to establish responsibilities and procedures for implementation in case of system failures, accidents, or other emergencies. The plan would include procedures to expedite remedial action in order to minimize hazards to the public and Pactex personnel, minimize damage to property and the environment, and limit accidental discharge from the piping system.

G.1 COMPONENTS

The principal components of Pactex's OSCP are summarized below:

(1) Designation of the members of the oil spill task force within the company, as well as their responsibilities and communication procedures.

(2) List of persons and governmental agencies to be contacted in the event of a spill and the information and time requirements for notification.

(3) Description of specific response procedures as a function of the spill size and the characteristics of areas potentially affected such as streambeds and areas of special biological significance.

(4) Inventory of the spill containment and cleanup equipment at the site and at proximate locations that could be mobilized in the event of an emergency.

(5) Training procedures for personnel, including a description of the methods for recovering spilled oil and disposing of oil-contaminated material.

(6) List of the locally and regionally available manpower and contractors providing specialized cleanup equipment and expertise.

(7) Discussion of oil spill and fire prevention techniques and equipment incorporated into the design of the facility and routine monitoring practices to detect pollution or equipment malfunction.

The overall Pactex OSCP would be divided into the three major sections: Berthing/Terminal Facilities, Pipeline System, and Midland Terminal. An outline of the OSCP requirements is given below. After final design is completed and operational decisions have been made, the outline would be expanded and revised, and the OSCP prepared. The OSCP would be periodically revised, updated, and audited by regulatory agencies to ensure timely and effective action in the event of an accidental spill.

G.2 PORT/TERMINAL FACILITY

SECTION 1 - INTRODUCTION

1.1 FACILITY DESCRIPTION

Decisions that evolve from the development of the Pactex OSCP would stem from facts about the facililties. Descriptions would be given of the facility, berths, tank storage area, pumps, valves, and piping, including the general operational information about tanker arrivals, oil handling, volume of crude oil transfer, and storage. The plan would incorporate information from ongoing meetings between Pactex, POLA, Los Angeles Fire Department (LAFD), and USCG as engineering plans are developed.

1.2 SCOPE AND OBJECTIVE OF THE OSCP

This subsection would discuss the general scope of the Pactex facility contingency plan and interaction with the following existing plans:

(1) POLA OSCP - prepared by the Port Warden.

(2) Captain of Port of Los Angeles/Long Beach OSCP-prepared by the USCG.

(3) National Oil and Hazardous Substances Pollution Contingency Plan - Council on Environmental Quality.

(4) State of California OSCP.

(5) Clean Coastal Waters OSCP.

1.3 PLAN DEVELOPMENT AND UPDATING

As more specific details are developed on the port facility, this outline would be expanded into a comprehensive plan to control accidental oil spills. Revising, updating, and auditing would be continued to ensure that the plan provides for a prompt and effective response to spill control needs.

SECTION 2 - PLAN DEVELOPMENT

2.1 ACCIDENTAL SPILL ASSESSMENT

Prevention of a spill would be emphasized in facility design and operation. Realizing that accidental spills can occur, an assessment would be made to

determine what types and/or volumes of spills may occur, what are the worst-case probabilities, and under what circumstances an accidental spill might occur.

2.2 SPILL MOVEMENT

Information on tides, currents, and weather conditions would forecast the movement of accidental spills on the water surface. Critical environmental, recreational, and public-use areas near the facility would be identified for special protection. (Preliminary data on trajectories from an oil spill in POLA is given in subsection 4.2.15.)

2.3 ANTICIPATED SPILL SITUATIONS

The preceding data would provide critical information regarding the development of an effective OSCP for the facility. It is anticipated that three general spill situations would be identified for consideration in the plan:

(1) Minor spill: small volume, localized in the facility area. Quick response by the facility personnel would be effective in controlling most of the spills in this category.

(2) Medium spill: larger volume spill that, due to weather or current conditions, coupled with the time required for containment, may move beyond the immediate facility area.

(3) Larger spill: a spill with an impact beyond the immediate facility that would effect sensitive areas within the port areas requiring protection.

2.4 OIL SPILL CONTROL EQUIPMENT

The scenarios listed above would provide the data upon which equipment needs, equipment and material storage, and response organization needs would be determined. Generally, a storage facility would store booms, absorbents, and auxiliary equipment to control and contain spills quickly in the POLA area as part of the detailed contingency planning. Equipment available through other port facilities, as well as other potential sources, would be evaluated to meet the needs of effective spill control. Cooperation or membership in Southern California oil spill cooperatives such as the Southern California Petroleum Contingency Organization or Clean Coastal Waters would be recommended.

Equipment would be stored and maintained at a Pactex POLA storage facility so that rapid and effective deployment would be ensured.

2.5 OIL SPILL CONTROL ORGANIZATION

The data developed for oil spill response and the equipment defined must be used effectively by the development of a skilled quick-response manpower team.

Pactex personnel would be identified and trained to carry out specific assignments in the event of an accidental spill. Immediate action by on-scene personnel would be required to control the spill situation effectively. In addition, the detailed OSCP would identify additional sources of manpower and expertise (e.g., oil spill cooperatives in Southern California) so that an effective organized manpower team would be mobilized quickly to meet the specific needs of the spill situation.

An important aspect of the OSCP would be the development of a notification and alerting procedure both within the POLA facility and externally to the various governmental agencies. A small trained Pactex task force would be stationed within the POLA facility to maintain equipment, conduct drills, and provide the initial response to a spill situation. The detailed OSCP would provide a mechanism for augmenting this task force, as required, to meet the needs of the specific situation.

SECTION 3 - SPILL PLAN IMPLEMENTATION

3.1 NOTIFICATION

A checklist would be developed to ensure that proper alerting and notification procedures are followed in the event of any spill situation.

3.2 SPILL CONTROL

On-scene Pactex personnel would react quickly to halt the discharge of oil. In most cases, this reaction should ensure that the oil would be contained within the facility or in proximity to it. Sufficient containment equipment would be available at the POLA facility for spill control. Outside assistance from oil cooperatives and oil spill cleanup companies in the POLA area (e.g., vacuum trucks or skimmers) may be required to remove the oil from the water. Prior arrangements (e.g., with cooperatives or contractors) would ensure the availability of this support equipment. The plan would also include a disposal procedure for oil-soaked debris or absorbents.

Arrangements for the use of larger spill control equipment (e.g., skimmers, heavy-duty booms, and work boats) would also be finalized in the event that the spill is larger and beyond the immediate control capability of the Pactex facility quick-response team.

3.3 TRAINING AND COORDINATION

Training and coordination of efforts is an important area of concern. Through initial training, periodic updates, and drills, the Pactex facility response team would be prepared for spill control activity. Prior to oil transfer at the POLA facility, the necessary coordination and planning would be completed so that an effective OSCP would be available at the onset of POLA facility operations.

3.4 POLA FACILITY

This subsection would discuss the handling and prevention of possible accidental oil spills that could occur during the offloading and fueling of tankers at the POLA berthing facility. The possibilities of leaks occurring during these operations would mainly involve temporary flanged joints on the ship deck's manifold connections. These areas would be under continuous surveillance throughout these operations so that a leak would be stopped quickly by shutting down the offloading or fueling pumps.

The offloading arms and subterranean pipeline to shore would also be under surveillance and would be inspected regularly. If a spill should occur, oil booms would be deployed and cleanup equipment dispatched to control the spread of oil and to clean up the residual oil. (Pactex would have a permanent boom installed around all tankers at berth).

3.5 POLA TERMINAL FACILITY

This subsection would discuss the causes and preventive measures relating to possible oil spills in the POLA terminal facility. This subsection would be developed in consultation with LAFD and USCG.

3.6 STORAGE TANKS

The possibilities of emergency conditions on a floating roof storage tank derive from overflow and/or fire. To prevent overflow, high-level alarms and controls would be installed. Alarms would allow at least 1 hour for response before an overflow could occur. This allowance would provide time for the terminal control operator and the central pipeline oil dispatcher to coordinate their activities. Under normal operating conditions, the high-level alarm would not be activated because the control operator and oil dispatcher would have previously scheduled the operation to ensure against such an accident.

If an overflow should occur, the oil would spill around the tanks into the diked area, which would not overflow because its capacity would be more than 125% of the capacity of the largest storage tank as required by code. The OSCP would include the requirement that a foam blanket be applied and maintained over the exposed oil surface to reduce the risk of fire until pumping equipment could place the oil into available storage.

Fires on floating roof tanks do not occur frequently at the seal between the tank roof and the tank shell. The causes of these fires can be lightning or static electricity. Historically, static electricity has been a cause of a seal fire, but design improvements have essentially eliminated this problem. Usually, a seal fire would be extinguished within a few minutes using readily available fire extinguishers.

3.7 PUMPS, VALVES, AND PIPING

Potential leaks and fires could occur in the areas of the pumps, valves, and piping systems if a pump or valve should fail, if joints are not tightened

correctly, or if harmful vibrations over a long time interval cause flanged connections to loosen and leak. Such a leak would be observed during routine surveillance of the areas. The pressure would be removed by shutting down the pumps and closing the valves. If a fire hazard existed, the oil surface would be blanketed with foam using readily available fire extinguishers. The area would be cleaned up and repairs completed.

G.3 PIPELINE SYSTEM

SECTION 1 - CONTINGENCY PLAN OUTLINE

This section would outline the scope of the OSCP for the Pactex pipeline and provides specific parameters that would guide the preparation of the OSCP. The OSCP would follow the outline provided for the Port/Terminal Facility.

Both the maintenance bases and the bases at the POLA and Midland Terminals would play key roles in supporting the OSCP. Each base would undertake a continuing program to train and drill personnel, review and verify the state of readiness of emergency vehicles and equipment, and update the sections of the OSCP that apply to their concerned area of surveillance.

The OSCP would contain certain basic information that would be organized under the following concepts:

(1) Procedures for notification in case of a leak or spill and definition of responsibilities for taking action.

(2) Methods for rapid assessment of the source of the problem, stoppage of flow, and reduction of pressure to minimize damage.

(3) Control of pollution in each situation. This subsection would identify the location of equipment provided in each area to contain a spill, recover the oil, and clean up the area.

(4) Repair procedures required to place the system back into safe operation.

(5) Cleanup of the environmental damage and restoration.

These general concepts would provide the pattern for the preparation of the OSCP for each area.

SECTION 2 - PIPELINE

The quantity of oil that could be lost from a pipeline leak is limited by the pressure in the system, the time during which the leak could go undetected before it is stopped, and the size of the pipe opening. An oil spill analysis, including historical causes and frequencies, is detailed in subsection 4.2.17. Design, construction, and operating features that would prevent or minimize oil spills are discussed in subsection 2.2.

In a liquid pipeline, the quantity that could be spilled is limited within any given area by the undulations of the terrain with each undulation forming a liquid trap. An appraisal of the maximum quantity of oil that could be spilled would be based on a detailed review of each section of the pipeline after detailed surveys are completed. Detection, identification, and possible oil spill volumes are discussed in subsection 4.2.17.

SECTION 3 - CONTAINMENT AND CLEANUP OF SPILLS

A comprehensive OSCP that would provide for prompt and efficient discovery, containment, and cleanup of any spill of crude oil from the system would be developed prior to placing the system in operation. Maintenance crews would be equipped with earthmoving equipment and oil recovery and containment equipment. Methods used to contain and clean up the leak would vary depending on the location, amount of oil released, and the requirements of the landowner and regulatory agencies having jurisdiction. Considerable experience and technology has been developed by the oil and transportation industry in the containment and cleanup of crude oil spills. Containment and cleanup techniques would be included and detailed in the OSCP.

After notification of a leakage, a Pactex crew would be dispatched to the site to determine the magnitude of the discharge and to implement the OSCP to rectify the situation. A typical OSCP calls for efforts that would confine the spilled oil in a ditch or draw where it could be recovered with portable pumps and tank trucks. Use of earthmoving equipment to build dams or excavate pits might be used; booms, retards, and other devices could be used to contain the oil in natural drainage areas. After the bulk of the spill is recovered, appropriate cleanup and rehabilitation techniques would be used.

Vapors that could be released to the atmosphere from a spill are directly related to the volume of oil spilled, the length of time it is exposed to the atmosphere, and the temperature of the oil. Vapors usually disperse quite rapidly, except in calm atmospheric conditions.

Major water crossings would have valves on each side of the river to isolate a line failure in the stream. If such a failure should occur, a sizeable quantity of oil could be released into the stream. Containment and cleanup of this kind of spill is the most difficult and would require the use of booms, absorbents, skimmers, and other materials and techniques. These types of spills would be given special study, and appropriate plans would be prepared for containment, removal, and disposal. Moreover, stream crossings would be designed and installed to establish structures that are safe for the life of the pipeline system. The Celeron/All-American EIR/EIS presented a draft OSCP for the Colorado River Crossing. This information would be incorporated in the Pactex OSCP. The handling of a large leak would include the following methods:

(1) The system would be shut down as quickly and safely as possible by the pipeline dispatcher or possibly automatically, and the leaking section would be isolated by closing valves.

(2) O&M personnel would be alerted immediately and dispatched by land or air to locate the site, assess the break, and select and implement the OSCP for the type and location of leak to result in minimum hazard to people and property and the least spill of the product.

SECTION 4 - PUMP STATIONS

This section of the contingency plan would focus on oil leakage and fire emergencies at pump station sites. The pump station OSCP section would also cover valve operation and electrical power circuit operation, as well as the methods available to extinguish oil and electrical fires. Pumps and valves would be equipped with sealing devices that seal off the product under pressure from the atmosphere around the shaft, which would drive the pump or operate the valve. The present design of valve seals is highly reliable, and leaks from this source are almost nonexistent. Mechanical seals on pumps are subject to wear and can fail periodically. A seal failure detection device would be installed on each pump, coupled with a spill containment system that, in the event of a seal failure, would prevent the product from being released, automatically shutting down the unit and alerting the dispatcher to the existence of the faulty seal.

Present technology on gaskets is quite advanced and leaky gaskets are rare, but they may occur. Measures to be taken to minimize leaks from this source would be to design the system to minimize the use of gaskets, use the best gasket material available for the service, and properly install, test, and maintain the gasket joint. Gasket leaks are detected and corrected almost at once and with almost no spillage.

G.4 MIDLAND TERMINAL FACILITY

SECTION 1 - CONTINGENCY PLAN OUTLINE

The OSCP section for the Midland terminal facility would follow the pattern established for the POLA terminal facility. Specific instructions would be included on communications and responsibilities applicable to this facility.

Relationships with other entities receiving crude oil at Midland would comprise specific instructions in the emergency plan. These instructions would be developed in cooperation with personnel representing those entities, as well as the regulatory agencies in the Midland area.

SECTION 2 - STORAGE TANKS

The section on storage tanks at the Midland Terminal would be nearly identical to the corresponding section of the POLA OSCP terminal tanks.

SECTION 3 - PUMPS, VALVES, AND PIPING

The section on pumping units, valves, and manifold piping would be similar to the POLA terminal facility.

G.5 SUPPORT FACILITIES

The OSCP section on support facilities would focus primarily on communications but would also concern the operation of the electric power supply circuits and the preparedness of vehicles and equipment involved in the OSCP. Radio, microwave, and telephone communications would play a vital role in almost any type of emergency and especially in coordinating the activities at a remote repair site. Technical personnel would be designated to attend and maintain critical communications circuits and to implement temporary circuits as conditions may require in handling an emergency.

G.6 FEDERAL, STATE, AND POLA OIL SPILL RESPONSE TEAMS

In addition to individual operator contingency plans, Federal, state, and POLA contingency plans and oil spill response teams would also be in effect. These governmental levels of response and their relationship to the Pactex contingency plan in the event of a major spill incident are described below.

G.6.1 FEDERAL RESPONSE

A Federal response is comprised of several different levels of response: the National Response Team, National Strike Force, Regional Response Teams, and the designated on-scene coordinator (OSC) at the local level.

The U.S. Environmental Protection Agency (EPA) is responsible for the protection of coastal waters, the Great Lakes, ports and harbors, and inland areas. As such, the EPA has established strike forces and Regional Response Teams to provide this protection. The Southern California coastal area is the jurisduction of the Pacific Strike Team, based in San Francisco. The Regional Response Team is under the direction of the OSC and is composed of the following knowledgeable agency officials: The Director of Surveillance and Analysis Division of the Regional Environmental Protection Agency, Commander of the U.S. Western Air Force Reserve Region; Director of the California Office of Emergency Services; and representatives from the USGG 11th Naval District, 6th U.S. Army Headquarters, U.S. Fish and Wildlife Service, and Regional Oil and Gas Division of the U.S. Geological Survey.

The onshore and inland spills are under the jurisdiction of the U.S. Regional EPA. Title 40, Part 112, requires that a Spill Prevention and Control and Countermeasure Plan be submitted to EPA within 6 months after the project begins operation. In the plan, the OSC coordinator and supporting agencies are identified for each segment of the pipeline.

In responding to a spill incident, the OSC would encourage the responsible parties to take the initiative in correcting the problem if they are able; if not able, the OSC would activate the Regional Response Team, Pacific Strike Team, and State Response Teams, as necessary. The OSC would be responsible for the adequacy of the spill response operation and would maintain surveillance over operations until completed satisfactorily. For onshore and inland spills, cleanup would supervised by the OSC but may be executed by a private contractor.

G.6.2 STATE RESPONSE

The State of California Oil Spill Contingency Plan provides for a coordinated response of state agencies to an oil spill. The plan designates a State Operating Authority (SOA) to represent the state on the Federal Regional Response Team and have the authority to declare an oil spill emergency requiring the activation of the State Contingency Plan. A representative of the California Department of Fish and Game has been designated as the current SOA.

The state's organizational framework for response to a major spill is multilevel. A State Support Team consisting of various state department directors would authorize the SOA and administer a standing State Interagency Oil Spill Committee (SIOSC). The SIOSC functions as a liaison with public and private oil pollution control organizations, reviews the State Contingency Plan, and recommends research and development. However, the SIOSC does not have any direct-line authority during an oil spill. The SOA would appoint a State Agency Coordinator to be in charge of all state agencies engaged in combating a pollution incident. These agencies would comprise the State Operating Team. The State Agency Coordinator would also act in a capacity similar to that of the Federal OSC.

G.6.3 POLA Response

The POLA OSCP (revised 1979) provides the following information:

(1) Procedures for the prevention of oil spills in the Los Angeles Harbor.

(2) Procedures for spill reporting.

(3) Procedures for containment and cleanup.

(4) Lists of containment and cleanup equipment available from private contractors in the harbor area.

(5) Lists of on-hand equipment from the Los Angeles Fire Department.

POLA has a 24-hour patrol on land and water in the harbor area. One of the patrol's primary duties is the prevention and detection of oil spills.

The POLA response would also be augmented by procedures set forth in two other local OSCPS:

(1) Captain of Port Los Angeles/Long Beach OSCP (U.S. Coast Guard)

(2) Clean Coastal Waters OSCP

G.7 OPERATIONS MANUAL

The USCG requirements for an Operations Manual are quoted below:

Subpart B--Operations Manuals

154.300 Operations manual: General.

(a) The facility operator of each facility to which this part applies must prepare and submit with his letter of intent to operate an operations manual that describes--

(1) The means and procedures that the applicant uses to meet the operating rules and equipment requirements prescribed by this part; and

(2) The duties and responsibilities of operations personnel in conducting oil transfer operations under this part.

(b) In determining whether the manual meets the requirements of this part, the Captain of the Port considers the size, complexity and capacity of the facility.

154.310 Operations manual: Contents.

Each operations manual required by 154,300 must contain--

(a) The geographic location of the facility:

(b) A physical description of the facility including a plan of the facility showing mooring areas, transfer locations, control stations, and locations of safety equipment;

(c) The hours of operation of the facility;

(d) The sizes, types, and number of vessels that the facility can transfer oil to or from simultaneously;

(e) The grade and trade name of each product transferred at the facility that is incompatible with oil;

(f) The minimum number of personnel on duty during transfer operations and their duties;

(g) The names and telephone numbers of facilitiy, Coast Guard, and other personnel who may be called by the employees of the facility in an emergency;

(h) The duties and responsibilities of watchmen required by 155.810 of this

chapter and 46 CFR 35.05-15 for unmanned vessels moored at the facility;

(i) A description of each communication system required by this part;

(j) The location and facilities of each personnel shelter, if any;

(k) A description and instructions for use of drip and discharge collection and vessel slop reception facilities if any;

(l) A description and the location of each emergency shutdown system;

(m) Quantity, type, location and instructions for use of the containment equipment required by 154.545;

(n) The maximum relief valve setting (or maximum system pressure when relief valves are not provide) for each oil transfer system;

(o) Procedures for--

(1) Operating each loading arm including the limitations of each loading arm;

(2) Transferring oil;

(3) Completion of pumping;

(4) Emergencies;

(p) A contingency plan for reporting and containing oil discharges; and

(q) A brief summary of applicable Federal, State, and local oil pollution laws and regulations.

(r) A description of the training and qualification program for persons in charge.

(s) Any other item the Captain of the Port requires, under 154.320 to cover a particular condition at the facility.

APPENDIX H

FIRE PROTECTION PLAN OUTLINE

H.1 INTRODUCTION

The proposed Pactex pipeline and berthing/terminal facilities would be designed to operate unmanned except for daily inspection of pump stations, 24-hour per day control room coverage, and weekly overflights of the pipeline route.

The pipeline and berthing/terminal facilities would be designed, constructed, and operated in accordance with all applicable Federal, state, Port of Los Angeles (POLA), and industry codes and practices as listed in subsections 4.2.16 and 4.2.17, as well as Appendix G.

Fire protection services for the berthing/terminal facilities would be provided by the City of Los Angeles Fire Department, which has five fire boats plus nine engine companies and two ladder companies located at POLA. Fire protection services for the pipeline facilities would be provided by the closest local fire department to the fire or emergency.

H.2 FIRE PROTECTION SYSTEM

H.2.1 BERTHING/TERMINAL FACILITIES

Design and operation of the berthing/terminal facilities would be in compliance with Division 95 of the Los Angeles Municipal Code and other applicable codes. Applicable sections of the Los Angeles Municipal Code follow:

(1) Fire Protection at Terminals and on Wharfs

Section 57.95.04, Fire Fighting - Access
Section 57.95.05, Fire Hydrant - Location
Section 57.95.06, Water System - Capacity
Section 57.95.07, Fire Equipment - Arrangement

(2) Foam Protection

Section 57.95.08, Foam Protection for Marine Oil Terminals
Section 57.95.09, Foam Equipment - Arrangement

(3) On-Board Vessels

Section 57.95.10, Fire Protection on the Vessel

(4) Precautions - General

Section 57.95.11, Smoking - Marine Oil Terminals
Section 57.95.12, Smoking - Open Flame, Aboard Vessel
Section 57.95.13, Security at Terminals

(5) Equipment

Section 57.95.17, Electrical System
Section 57.95.18, Pipe Lines
Section 57.95.19, Valves
Section 57.95.20, Access to Valves and Pipe Lines
Section 57.95.21, Bonding and Grounding of Pipe Lines

(6) Cargo Handling

Section 57.95.24, Notification by Terminal Superintendent
Section 57.95.25, Notification by Master
Section 57.95.26, Preloading Conference
Section 57.95.27, Master's Certification
Section 57.95.28, Refusal
Section 57.95.29, Electrical Bonding
Section 57.95.30, Mooring and Cargo Connections
Section 57.95.31, Starting to Transfer
Section 57.95.32, Transferring Across Deck Prohibited
Section 57.95.33, Hatches
Section 57.95.34, Ports and Doors to Quarters
Section 57.95.35, Miscellaneous Hazards
Section 57.95.42, Harbor Contamination
Section 57.95.43, Hazard Abatement
Section 57.95.44, Conditions Requiring Summary Action
Section 57.95.45, Terminal Superintendent
Section 57.95.46, Docking

Response to oil spills and fires would be as detailed in:

(1) POLA Oil Spill Contingency Plan
(2) Captain of Port of Los Angeles/Long Beach OSCP
(3) Clean Coastal Waters OSCP

H.2.2 PIPELINE FACILITIES

The proposed pipeline facilities would be equipped with the following systems:

(1) Smoke detectors
(2) Fire sensors
(3) Fire extinguishers

A. Smoke Detectors

Smoke detectors would be installed inside the switchgear and control cubicle at all of the pump stations. If the detectors should become actuated, an alarm would be sounded in the control room and dispatch center and the pump station shutdown system would be automatically triggered causing the bypass valves to be actuated and the pump station to be shut down.

B. Fire Sensors

Sensors would be installed at strategic locations around the pump stations. The sensors would be looking at those areas that could be the source of a fire. If a fire should be sensed, an alarm would be sounded in the control room and the pump station shutdown system would be automatically triggered causing the oil pipeline pump station bypass valves to be actuated and the pump station to be shut down.

Upon receiving the fire alarm in the control room, the dispatcher would institute the fire/emergency response procedures presented in this plan.

C. Fire Extinguishers

Adequate fire extinguishers would be located at strategic locations around the pump stations to extinguish very small fires in the event personnel are at the station when the fire breaks out. These extinguishers would be inspected and maintained in accordance with applicable fire codes.

H.2.3 CONTROL AND MONITORING

Critical operating parameters would be monitored continuously, and alarms would be triggered whenever abnormal conditions occur. The control systems listed below are either directly or indirectly related to fire protection:

(1) Pipeline supervisory control
(2) Leak detection
(3) Emergency shutdown
(4) Fire protection
(5) Tank gauging (POLA and Midland Terminals)

These operations are all carried out at the control center and at all stations and terminals.

A. Control Center

From the control center, the entire pipeline operations would be controlled and monitored via microwave transmission. A cathode ray tube (CRT) and keyboard would allow the dispatcher to control, program, and monitor all of the operations.

B. Security and Reliability

Operational security (i.e., assurance of proper operation) is provided by the operator interface with the CRT, annunciator, and data-alarm logger. The

reliability of the control system would center around a fault-tolerant system design, totally redundant computers and peripheral equipment, an uninterruptible power supply (UPS), and remote terminal units (RTU) equipped with standby power.

H.2.4 FIREFIGHTING TRAINING

Firefighting training would consist of classroom training on the extinguishment of fires with an emphasis on oil fires. Hands-on training would also be given in the use of fire extinguishers and firefighting equipment. Management personnel would attend an oil firefighting school at either the Western Oil and Gas Association school in Reno, Nevada, or at Texas A&M in College Station (Bryan), Texas. Historically, the training received at oil firefighting schools has been a key element in the operation of a safe petroleum facility. Coordination procedures would also be developed according to state laws, the local fire departments, and Pactex. These procedures would become part of the fire protection plan once they are developed.

H.2.5 FIRE DRILLS

Fire drills would be conducted not less than twice each year to ensure that mobilization plans and fire/emergency response procedures are adequate. These drills would ensure that all parties involved remain familiar with the procedures required to handle an oil fire. This is particularly important for those local fire departments that have no other dealings with this type of emergency.

H.2.6 FIRE/EMERGENCY RESPONSE PROCEDURES

In the event of a fire at a pump station, the following procedures would be followed:

(1) Call the local fire department in the area of the pump station.

(2) Call the local law enforcement department in the area of the pump station.

(3) Confirm that the pump station pumps are off and that the block valves are closed by checking the computer indicators.

(4) Call the following persons in the order listed below until one is reached and the situation is reported:

(to be provided by Pactex in the Operation Plan)

The person contacted would then assume responsibility for handling the situation and would dispatch company personnel to the scene.

(5) After completing the above, the dispatcher would report the situation to the General Manager of the pipeline and to local supervisors.

APPENDIX I

THREATENED, ENDANGERED, AND SENSITIVE SPECIES; OCEANOGRAPHY; MARINE BIOLOGY; AND MARINE HABITAT MITIGATION

Appendix I.1 lists the threatened, endangered, and sensitive species. Appendixes I.2 and I.3 provide tables and figures that contain most of the data summarized in subsection 3.2.15. Appendix I.4 shows the changes in biological habitat with the proposed landfill island and the two alternatives. Appendix I.5 summarizes oil spill processes that are relevant to the potential impacts of a harbor spill (as discussed in 4.2.15.F). Appendix I.6 summarizes the proposed mitigation for marine habitat impacts in POLA.

Table I.1-1 - Threatened, Endangered, and Sensitive Species

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
PLANTS					
Alverson's pincushion cactus	Coryphantha vivipara var. alversonii	Little San Bernardino Mountains to Eagle and Chuckwalla Mountains	Stony slopes 2,000 to 5,000 ft; creosote bush scrub; Joshua Tree woodland	Federal candidate Category 2,[a] CNPS-1b[b]	1, 2
Biscuit cactus	Coryphantha vivipara var. buoflama	Arizona	Flowers: May-June	Federal candidate Category 1	10
California ditaxis	Ditaxis californica	Santa Rosa Mountains to south side of Eagle Mountains	Sandy washes, 400 to 3,000 ft; creosote bush scrub	Federal candidate Category 2, CNPS-1b	1, 2, 3
Coachella Valley milk vetch	Astragalus lentiginosus var. coachellae	Coachella Valley near Thousand Palms	Winter annual in sandy soil below 1,200 ft; creosote bush scrub	Federal candidate Category 1, CNPS-1b	1, 2, 3, 4
Flat-seeded spurge	Euphorbia platysperma	Near Thousand Palms in Coachella Valley	Sandy soil; creosote bush scrub	Federal candidate Category 2	1, 3
Gypsum wild-buckweat	Eriogonum gypsophilum	Eddy Co., New Mexico	Open, almost pure gypsum in grama grassland at about 5,000 ft	Threatened (Fed),	8
Lee's pincushion cactus	Coryphantha sneedii var. leei	Eddy County, New Mexico	Limestone slopes, ledges, and ridgetops	Threatened (Fed)[c]	10, 8
Little San Bernardino Mountain linanthus	Linanthus maculatus	San Gorgonio Pass, Little San Bernardino Mountains	Sandy places, 500 to 4,000 ft; creosote bush scrub; Joshua Tree woodland	Federal candidate Category 2, CNPS-1b	1, 2, 3, 4
Lloyd's hedgehog cactus	Echinocereus lloydii	Dona Ana and Eddy Counties, New Mexico; Guadalupe Mountains, Texas	Southern, rocky hills	Endangered (Fed), Endangered (TX)[d]	5, 7
Los Angeles sunflower	Helianthus nuttallii spp. parishii	Los Angeles, San Bernardino, and Orange Counties (nearly extinct)	Wet ground, 1,000 to 5,000 ft	Federal candidate Category 2, CNPS-1a	1, 2, 6

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
PLANTS (Contd)					
Many-stemmed liveforever	Dudleya multicaulis	Historically, Los Angeles County to west San Bernardino, Riverside, and Orange Counties; potentially in Chino Hills near Brea, California	Dry, stony places below 2,000 ft; coastal sage scrub; chaparral	Federal candidate Category 2, CNPS-1b	1, 2, 4, 6
McKittrick pennyroyal	Hedeoma apiculatum	Guadalupe Mountains, Eddy County, New Mexico, and Texas[e]	Limestone crevices of canyon walls; among rocks along watercourses and ridge	Threatened (Fed), Threatened (TX)	7, 8, 9
Mojave fishhook cactus	Sclerocactus polyancistrus	Mojave Desert from Red Rock Canyon and Inyo County east; western Arizona	Gravelly mesas and slopes, 2,500 to 6,500 ft; creosote bush scrub to pinyon-juniper woodland	Federal candidate Category 2, CNPS-4	1, 2
Nevin's barberry	Mahonia nevinii	North Los Angeles County through San Fernando Valley and Arroyo Seco; San Timoteo Canyon near Redlands, California	Sandy and gravelly places below 2,000 ft; coastal sage scrub; chaparral	Federal candidate Category 1, CNPS-1b	1, 2, 3
Night blooming cactus	Cereus greggii	Anthony Pass, Franklin Mountains, Dona Ana County, New Mexico (T26S R4E S28) - Possibly Luna, Grant, and Hidalgo County	Gravelly or silty areas in washes or flats, 3,000 to 5,000 ft Flowers: June	Federal candidate Category 2, Species of concern (NM)	10
No common name	Coryphantha robbinsorum	Cochise County, Arizona	Limestone areas of rocky hills, 4,200 ft; desert grasslands Flowers: March-April	Federal candidate Category 1	10
No common name	Neollydia erectrocentra var. acunensis	Arizona	Well-drained knolls and gravel ridges between major washes in the Saguaro Palo Verde Association	Federal candidate Category 1	10
No common name	Polygonum fusiforme	Colorado River Valley	Moist places	Federal candidate Category 2	-

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
PLANTS (Contd)					
No common name	Salvia greatae	Orocopia Mountains to Chocolate Mountains, Riverside County	Dry washes and fans, below 600 ft; creosote bush scrub	Federal candidate Category 2, CNPS-1b	1, 2
Orcutt's aster	Xylorhiza orcuttii	Southwest Colorado desert, Imperial and San Diego Counties	Gypsum soils below 1,000 ft; creosote bush scrub	Federal candidate Category 2, CNPS-1b	1, 2
Pringle monardella	Monardella pringlei	Historicaly, near Colton, Jurupa Mountains, San Bernardino County; presumed extinct	Sandy places, coastal sage scrub	Federal candidate Category 1, CNPS-1a	1, 2, 4, 6
Robison monardella	Monardella robisonii	South base of Little San Bernardino Mountains, Joshua Tree National Monument, California	About rocks	Federal candidate Category 2, CNPS-1b	1, 2, 6
Roderick's fritillary	Fritillaria grayana	Historically, San Diego and Riverside Counties north to Mendocino County; potentially in Chino Hills near Diamond Bar, California	Heavy soil in grassy places below 3,000 ft, valley grassland	Federal candidate Category 2, CNPS-1b	1, 2, 6
Sand prickly pear	Opuntia arenaria	Rio Grande Valley - Mesquite Lake, Dona Ana County, New Mexico	Sand dunes near river; sandy floodplains in arroyos, 3,600 ft Flowers: May-June	Federal candidate Category 2	10
Santa Ana River eriastrum	Eriastrum densiflorum spp. sanctorum	Along Santa Ana River near upper headwaters, California	Below 1,500 ft; coastal sage scrub	Federal candidate Category 2, CNPS-1b	1, 2, 6
Slender-horned spineflower	Centrostegia leptoceras	Historically, San Fernando Valley to San Bernardino Valley and Elsinore; Colton, California	Sandy places; coastal sage scrub (Colton habitat mostly developed)	Federal candidate Category 1, CNPS-1b	1, 2, 6
Sneed's pincushion cactus	Coryphantha sneedi var. sneedi	Franklin Mountains, Anthony Gap, Dona Ana County, New Mexico; El Paso County, Texas (T26S R4E S33,27)[e]	Limestone ledges in deserts and grasslands, 4,300 to 5,400 ft Flowers: April-September	Endangered (Fed), Endangered (TX)	7, 10, 11

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
PLANT COMMUNITIES					
Tumamoc globeberry	Tumamoca macdougalii	Tumamoc Hill near Tucson; several other populations known, Arizona	Dry soil among rocks, around 2,500 ft	Federal candidate Category 1	12, 13
Desert dune communities	N/A	Gypsum Sand Dunes Nature Preserve, Texas	-	Texas Nature Conservancy	-
Ironwood washes	N/A	Near Blythe, Riverside County	-	BLM sensitive (CA)	-
Riparian woodlands	N/A	Coastal stream crossings	-	-	-
AMPHIBIANS/REPTILES					
Baird's rat snake	Elaphe obsoleta bairdi	Texas[f]	-	Threatened (TX)	7
Big bend milk snake	Lampropeltis triangulum celaenops	Texas[e]	From lowlands to mountains coniferous forest, broad-leaf woodland, river bottoms, rocky hillsides, prairies, sand dunes, farm lands	Threatened (TX)	7, 14
Coachella Valley fringe-toed lizard	Uma inornata	Coachella Valley, California	Blowsand ecosystem	Threatened (Fed), Endangered (CA)[g]	10
Desert tortoise	Gopherus agassizi	Southeast Arizona to Mojave Desert and uplands east of Salton Basin, California; absent from Coachella Valley, California	Desert oases, riverbanks, washes, dunes, and occasionally rocky slopes; constructs burrows with half-moon shaped openings often at base of bushes and in banks of washes; creosote bush is often present	Federal candidate Category 2, Group 3 (AZ),[h] Sensitive (BLM)	16, 17, 18, 19
Flat-tailed horned lizard	Phrynosoma m'calli	Coachella Valley southward; flats east of Palm Springs; San Felipe Wash area and Sand Hills, Imperial County, California; southwest Arizona	Fine windblown sand of creosote bush and mesquite desert; threatened by agriculture and urban development and by ORV activity	Federal candidate Category 2, Group 3 (AZ)	4, 16, 17

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
AMPHIBIANS/REPTILES (Contd)					
Gila monster	Heloderma suspectum	Extreme southwest Utah to south Sonora; extreme southwest New Mexico to Colorado River; south Nevada and southeast California; western base of Providence Mountains, San Bernardino County; reported at Imperial Dam, Imperial County, California	Lower slopes of mountains and outwash plains; canyon bottoms of arroyos with permanent or intermittent streams; seeks shelter in wood rat nests, dense thickets, and under rocks	Federal candidate Category 2, Group 1 (NM)[i]	17, 20
Gray-banded kingsnake	Lampropeltis mexicana alterna	Texas[e]	-	Threatened (TX)	7
Leopard frog	Rana chiricahuensis	Lordsburg Playas, Hidalgo County, New Mexico (T23S R21W S24)	Near water	Special concern (NM)	10
Mojave desert fringe-toed lizard	Uma scoparia	Mojave Desert, California; Arizona, near Quartzite, Bouse Wash, Yuma County	Fine, windblown, sandy areas	Group 3 (AZ)	14, 16
Mountain short-horned lizard	Phrynosoma douglasii hernandesi	Texas[e]	From semiarid plains high into mountains	Threatened (TX)	7, 14
Orange-throated whiptail	Cnemidophorus hyperthrus	Laguna Beach, Orange County; vicinity of Colton, San Bernardino County; west of crest of Peninsular Ranges into Baja, California	Coastal chaparral; washes and other sandy areas where there are rocks and patches of brush; buckwheat, black sage, and chamise are often present	Federal candidate Category 2	4, 17
Presidio canyon lizard	Sceloporus merriami longipunctatus	Texas[e]	-	Endangered (TX)	7
Rock rattlesnake	Crotalus lepidus	Southeast Arizona; southern New Mexico; west Texas[e]	Rocky ridges and hillsides, may occur in lowlands	Threatened (TX)	7, 14
San Diego horned lizard	Phrynosoma coronatum blainvillei	Early 1900s near Cabazon, Reche Canyon, Banning; Whittier Narrows, California	-	Federal candidate Category 2	4

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
AMPIBIANS/REPTILES (Contd)					
Texas horned lizard	Phrynosoma cornutum	Texas[e]; New Mexico	Arid and semiarid open country with sparse plant growth	Threatened (TX)	7, 14
Texas lyre snake	Trimorphodon biscutatus vilkinsoni	Southern New Mexico; west Texas[e]	In mountains	Threatened (TX)	7, 14
Trans-Pecos copperhead	Agkistrodon contortrix pictigaster	Texas[f]	-	Threatened (TX)	7
Trans-Pecos rat snake	Elaphe subocularis	Guadalupe Mountains, Texas[e]; New Mexico - Dona Ana County along Rio Grande, also Anthony Gap in Franklin Mountains (T26S R4E)	Chihuahuan Desert, rocky areas with shrubby vegetation	Threatened (TX) Group II (NM)	7, 10, 14, 20
MAMMALS					
Bighorn sheep	Ovis canadensis	Texas[e]	Mountain slopes with sparse tree growth, rugged terrain	Endangered (TX) Group I (NM)	7, 20
Desert bighorn sheep	Ovis candadensis mexicana (in Arizona) Ovis canadensis nelsoni (in California)	Arizona, Plomosa and Dome Rock Mountains, Kofa National Wildlife Refuge - Yuma County; California - Mountains in CDCA including Santa Rosa, San Jacinto, Little San Bernardino, Chuckwalla, Orocopia Mountains	Rocky, steep slopes of mountains	Group 3 (AZ), Group 1 (NM) Sensitive (BLM)	10, 16, 19, 21
Spotted bat	Euderma maculatum	Texas[f]; New Mexico, Arizona, California	From ponderosa pine belt to lower Sonoran life zone	Threatened (TX)	7, 22
Stephens kangaroo rat	Dipodomys stephensi	Twenty known localities in its former range; badlands southwest of San Timoteo Canyon and north of Sunnymead, Reche Canyon, San Jacinto Valley, west Riverside and San Bernardino Counties, California	Flat terrain with sparse vegetative cover; sandy or gravelly soil	Federal candidate Category 2, Rare (CA)	23, 24

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
MAMMALS (Contd)					
Yuma puma	Felis concolor browni	Hualpai Mountains; Kofa Mountains, Arizona; occasional sightings near Colorado River	Rugged mountains	Federal candidate Category 2	23
BIRDS					
American peregrine falcon	Falco peregrinus anatum	Texas[e]; Arizona, Yuma County, Kofa National Wildlife Refuge, Winchester Mountains; California; New Mexico, Rio Grande, Luna County	Rocky cliffs for nesting	Endangered (Fed), Endangered (TX), Group I (NM), Endangered (CA)	7, 15, 20, 25, 26
Aplomado falcon	Falco femoralis septentrionalis	Texas[f]; southern New Mexico, Grant County; Arizona near Huachuca Mountains	Arid, brushy prairie, yucca flats	Threatened (TX), Group 1 (AZ),	7, 16
Arctic peregrine falcon	Falco peregrinus tundrius	Texas[e]	-	Endangered (TX)	7
Bald eagle	Haliaeetus leucocephalus	Texas[j]; Colorado River downstream from pipeline crossing - Riverside County, California; Yuma County, Arizona	Roosts in trees and nearby water areas - winter only; nests along Salt and Verde Rivers - Arizona	Endangered (Fed), Endangered (TX), Endangered (CA), Group II (NM), Group 2 (AZ)	7, 15, 16, 20
Bell's vireo	Vireo bellii	New Mexico, Animas Mountains, and north	Willow thickets along lowland streams, mesquite	Group II (NM)	20
Black hawk	Buteogallus anthracinus anthracinus	Texas[j]; Arizona, Muleshoe Ranch, Cochise County; southwest New Mexico	Wooded stream bottoms	Threatened (TX), Group 3 (AZ), Group II (NM)	7, 16, 20
Blue-throated hummingbird	Lampornis clemenciae	New Mexico, Anthony Gap, Franklin Mountains, Dona Ana County (T26S R4E S34)	Wooded streams in lower canyons of mountains	Special Concern (NM), Group 4 (AZ)	10, 16

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
BIRDS (Contd)					
California black rail	Laterallus jamaicensis coturniculis	In coastal salt marshes from Marin County to northern Baja; freshwater marshes of delta of Sacramento and San Joaquin Rivers; marshes above and below Imperial Dam on Colorado River	Saltwater and freshwater marshes; destruction of habitat by filling and draining greater threat to existence	Federal candidate Category 2, Rare (CA), Group 2 (AZ)	15, 16, 27
California brown pelican	Pelecanus occidentalis californicus	Channel Islands off California coast, POLA	Coast	Endangered (Fed), Endangered (CA)	15
California least tern	Sterna antillarum browni	POLA, Santa Barbara Channel area, and various nesting colonies along California coast	Coast and sandy beaches	Endangered (Fed), Endangered (CA)	15
Coastal blacktailed gnatcatcher	Polioptila melanura californica	Coastal southern California west of Transverse and Peninsular Ranges; in Riverside County near Lake Matthews, Monument Peak, and Lake Perris	Sage scrub vegetation, especially low growths of coastal and inland sage scrub occurring on arid hillsides, mesas, and washes below 2,000 ft; threatened by urban and agricultural development	Federal candidate Category 2	28
Ferruginous hawk	Buteo regalis	Locally known from Lakeview-Perris area, Riverside County; Imperial County, California	Open field, grasslands, and agricultural areas; on coastal slope, on open coastal plains, and interior valleys	Federal candidate Category 2	25, 29, 30
Fulvous whistling duck	Dendrocygna bicolor	Salton Sea; Colorado River and Desert; very rare along the Colorado River	Marshes and irrigated land	Federal candidate Category 2	25, 29
Gila woodpecker	Melanerpes uropygialis uropygialis	New Mexico, Gila Valley, Grant County and Hildago County, New Mexico	Desert washes, saguaros, river groves, cottonwoods	Group II (NM)	20

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
BIRDS (Contd)					
Golden eagle	Aquila chrysaetos	Widespread in North America	Open mountains, foothills, canyons, plains; prefers cliffs for nest sites	Sensitive (Forest Service)	10
Gray hawk	Buteo nitidus maximus	Arizona, Muleshoe Range, Cochise County; Texas; Gila and Mimbres Valleys, New Mexico	Wooded lowland streams; nests in mesquite, cottonwoods	Group 2 (AZ), Threatened (TX),	7, 16, 20
Interior least tern	Sterna albifrons athalassos	Texas[e]	-	Endangered (TX)	7
Least Bell's vireo	Vireo bellii pusillus	Historically, from San Diego north along the coast to southern Santa Clara County and into warmer, drier interior valleys; Owens and Death Valleys; desert oases and riparian areas from Mojave Desert; presently restricted to scattered riparian habitat in southern California; San Timoteo Canyon, Santa Ana River; Riverside County, Whittier Narrows Park, Los Angeles County, California	Riparian growth either in the vicinity of water or in dry parts of river bottoms especially dense willow thickets; threatened by habitat destruction and nest parasitism by brown-headed cowbird	Proposed-Endangered (Fed) Endangered (CA)	15, 31, 32
Mississippi kite	Ictinia mississippiensis	Arizona, San Pedro, Salt and Verde Rivers; New Mexico, Rio Grande Valley, Dona Ana County	Near river, riparian	Group 3 (AZ), Group II (NM)	16, 20
Mountain plover	Charadrius montanus	Formerly wintered on coastal plains of Orange County and San Fernando Valley, Los Angeles County; south end of Salton Sea, Imperial Valley; uncommon along the Colorado River - occurs mostly in the vicinity of Blythe	In southern California, occurs in grasslands and agricultural lands of the interior; breeds in short grass prairie and sagebrush	Federal candidate Category 2	25, 29

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
BIRDS (Contd)					
Northern beardless tyrannulet	Camptostoma imberbe ridgwayi	Arizona	Woodlands, thickets	Group 3 (AZ)	16
Olivaceous cormorant	Phalacrocorax olivaceous	New Mexico, Rio Grande Valley, Dona Ana County, Gila Valley, Grant County	Water, riparian, river	Group II (NM)	20
Osprey	Pandion haliaetus carolinensis	Texas[e], Arizona	Rivers, lakes, coasts	Threatened (TX), Group 3 (AZ)	7, 16
Rufous-winged sparrow	Aimophila carpalis	Arizona, Coyote Mountains, Tucson Mountains, east Tucson, Oracle, Sonora to Sinaloa	Tall desert grass (tubosa), desert thornbrush	Status undetermined (AZ)	10
Swainson's hawk	Buteo swainsoni	In California, originally Sacramento and San Joaquin Valleys, coastally from Marin County to San Diego; spotty distribution in CDCA-Mojave Desert, known from Colorado River Valley	Open plains, grassland, or flat terrain; avoids rough, wooded terrain; needs large shrub or tree for nesting and perching site; in eastern Mojave Desert, preferred habitat is Joshua Tree mixed scrub	Federal candidate Category 2, Rare (CA)	15, 25, 29, 33
Swallow-tailed kite	Elanoides forficatus	Texas[f]	Swamps, marshes, riverbanks, and open forests	Threatened (TX)	7, 25
Tricolored blackbird	Agelaius tricolor	Breeds and winters locally through all of the coastal counties, including the interior portions; small numbers have been found in recent winters on the deserts; casual in eastern southern California; individuals recorded at Panamint Springs and Furnace Creek Ranch, Inyo County; Kelso, San Bernardino County; near Finney Lake and Calexico, Imperial County, California	Marshes of cattails or tules; breed in dense colonies in extensive reed beds; most foraging takes place in agricultural areas or on open lawns (golf courses, cemeteries, etc.)	Federal candidate Category 2	29

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
BIRDS (Contd)					
Western snowy plover	Charadrius alexandrinus nivosus	Reduced along the coast as a nesting species; remaining nesting areas include San Diego County and Vandenberg AFB, Santa Barbara; breeding range includes some of the Channel Islands; nests fairly common at Salton Sea in the summer; visits desert areas in summer; scattered breeding localities in interior	Beaches, sand flats, and alkali ponds	Federal candidate Category 2	25, 29
Western yellowbilled cuckoo	Coccyzus americanus occidentalis	Historically, nested along rivers and streams from Shasta County to southern California; also now known in Santa Ana River, Riverside; Colorado River from Needles to Laguna; sightings at Blythe	Riparian habitats mostly characterized by willows; dense low-level understory foliage	Federal candidate Category 2, Rare (CA)	15, 34
White-faced ibis	Plegadis chihi	Texas[e]	Shallow water	Threatened (TX)	25, 26
Whooping crane	Grus americana	Willcox playa, western New Mexico, occasionally in winter	Marshlands, agriculture, water	Endangered (Fed)	13
Wood stork	Mycteria americana	Texas[e]; southern California; southern Arizona; southern New Mexico	Shallow water, marshes, ponds, lagoons	Threatened (TX)	7, 26
Yuma clapper rail	Rallus longirostris yumaensis	Colorado River - downstream from pipeline crossing, Riverside County California; Yuma County, Arizona; Gila River, Arizona	Marshy areas along Colorado River, Gila River, agricultural drains	Endangered (Fed), Rare (CA), Group 3 (AZ)	15, 16
Zone-tailed hawk	Buteo albonotatus	Texas[e], Arizona, central, southern and northeastern New Mexico; Muleshoe Ranch, Cochise County	Arid country, desert mountains, rivers	No official status - limited distribution (AZ), Threatened (TX)	7, 10, 25 26

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
FISH					
Big scale logperch	Percina macrolepida	Pecos River, New Mexico	River	Group II (NM)	20
Blue sucker	Cycleptus elongatus	Texas[f]; Pecos River, New Mexico	Streams, rivers	Threatened (TX), Group I (NM)	7, 20
Bonytail	Gila elegans	Colorado River system	Swift water of the river	Endangered (Fed), Group 2 (AZ), Endangered (CA)	15, 16, 36
Colorado squawfish	Ptychocheilus lucius	Colorado River system	Deep fast, flowing waters	Endangered (Fed), Group 1 (AZ), Endangered (CA)	15, 16, 36
Gila chub	Gila intermedia	Central and southern Arizona throughout the Gila River system; Hot Springs Canyon and Bass Canyon Creeks, Arizona	Deeper waters of smaller creeks and some artificial impoundments	Federal candidate Category 1, Group 3 (AZ)	16, 37, 38
Gila topminnow	Poeciliopsis occidentalis occidentalis	Gila River system, Arizona	Rivers	Endangered (Fed), Group 3 (AZ)	16
Greenthroat darter	Etheostoma lepidum	Pecos River, New Mexico	Rivers, tributaries	Group II (NM)	20
Loach minnow	Tiaroga cobitis	Gila River system, Arizona; New Mexico	Streams, rivers	Federal candidate Category 1, Group 3 (AZ), Group II (NM)	16, 20
Mexican tetra	Astyanax mexicanus	Rio Grande and Pecos River, New Mexico	Streams, rivers	Group II (NM)	20
Razorback sucker (humpback sucker)	Xyrauchen texanus	Formerly throughout Colorado River and major tributaries; now in Lower Colorado River, Lakes Mojave and Havasu, and Senator Wash Reservoir; occasional takings in California portion of the river	Prefers 3-ft-deep water over bottoms of sand, mud, or gravel; populations greatly reduced	Federal candidate Category 2, Group 3 (AZ), Endangered (CA)	15, 16, 36

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
FISH (Contd)					
Spikedace	Meda fulgida	Gila River system, Arizona; New Mexico	Streams, rivers, moving water, less than 3 ft deep	Federal candidate Category 1, Group 3 (AZ), Group II (NM)	16, 20
Unarmored threespine stickleback	Gasterosteus aculeatus williamsoni	Upper Santa Clara River, Los Angeles County, San Antonio Creek, Santa Barbara County, California	Originally in Los Angeles, San Gabriel, Santa Ana, and Santa Clara Rivers; prefers slow-moving streams and shallow pools with abundant algae and aquatic plants	Endangered (Fed), Endangered (CA)	15, 36
INVERTEBRATES					
Badwater snail	Assiminea infima	Bad Water, Death Valley National Monument, California	Saline seepage into salt-saturated pools, as well as protected situations just out of water on salt crust or vegetation	Federal candidate Category 2	39
California brackish water snail	Tryonia imitator	Salmon Creek, Sonoma County to Imperial Beach, San Diego County	Brackish lagoons and estuaries; restricted to areas where freshwater and seawater mix to create brackish water	Federal candidate Category 2	39
California McCoy snail	Micrarionta rowelli mccoiana	Various sites in McCoy and Rio Maria Mountains, including McCoy Well, McCoy Mountains, possibly Palen Mountains, Riverside County, California	Rockslides in gullies; habitat threatened by mining activities	Federal candidate Category 2	40
Coachella giant sand treader cricket	Macrobanetes valgum	South of Palm Springs Depot, 9 miles west of Palm Springs, east to 2 miles west of Indio	Sand dunes and windswept sand dune ridges	Federal candidate Category 2	41
Coachella Valley Jerusalem cricket	Stenopelmatus cahuilaensis	Coachella Valley	Coachella Valley blowsand habitat	Federal candidate Category 2	42

Table I.1-1 (Contd)

Common Name	Scientific Name	Occurrence	Habitat/Flowering Time	Status (federal/state)	Annotated Reference
INVERTEBRATES (Contd)					
Colorado desert snail	Micrarionta morongoana	Gulch on north side of Morongo Pass, 2 miles below the Morongo Inn, San Bernardino, California	-	Federal candidate Category 2	40
Greenest tiger beetle	Cincindela tranquebarica viridissima	-	-	Federal candidate Category 2	-
Henne's eucosman moth	Eucosma hennei	Along the coast, El Segundo Sand Dunes, Los Angeles County, California	Sand dunes	Federal candidate Category 2	43
Mojave Desert blister beetle	Lytta inseparata	Only three historic records known: San Diego, 1901; Mojave Desert, 1874; and Ventura County prior to 1960	Very rare; can undergo diapause for several years	Federal candidate Category 2	44, 45
New Mexico ram's horn snail	Pecosorbis kansasensis	Guadalupe Mountains, Eddy County, New Mexico	Seasonal rock pools	Federal candidate Category 1	46, 47
Wandering skipper	Pseudocopaeodes eunus eunus	San Diego County north to Mojave River, Victorville area, and Owens Valley	Rare in lowland desert areas, occurring in alkalai flats	Federal candidate Category 2	48

References (annotated):

1 Munz, 1974
2 CNPS, 1984
3 Knehr, 1985
4 CNDDB
5 Olwell, 1985a
6 Krantz, 1985
7 TPWD, 1985
8 NMNPPAC, 1984
9 FWS, 1985
10 BLM, 1984a, pp. B-18 to B-33
11 Olwell, 1985b
12 Kearney and Peebles, 1951
13 Reichenbacher, 1985
14 Stebbins, 1966
15 CDFG, 1980
16 AGFC, 1982
17 Stebbins, 1972
18 BLM, 1979
19 CDCA, 1980
20 NMDGF, 1979; NMDGF, 1983
21 BLM, undated file on bighorn sheep
22 Burt and Grossenheider, 1976
23 Hall and Kelson, 1959
24 Hicks and Cooperrider, 1976
25 Robbins, Bruun, and Zim, 1983
26 Peterson, 1961
27 Repking and Ohmart, 1977
28 Atwood, 1980
29 Garrett and Dunn, 1981
30 BLM, undated Rex-2 data base
31 Goldwasser, 1978
32 Goldwasser et al., 1980
33 England, 1979
34 Craig, 1977
35 Lewis, 1985
36 Moyle, 1976
37 Minckley, 1973
38 Brooks, 1985
39 Taylor, 1981
40 Roth, 1972
41 Tinkham, 1962
42 CVFTL HCP, 1984
43 Donahue, 1984
44 Pinto, 1985
45 Selander, 1960
46 Stefferud, 1985
47 Taylor, 1983
48 Emmel and Emmel, 1973

Table I.1-1 (Contd)

[a]U.S. Fish and Wildlife Service - Federal Register Vol. 48, No. 229.
Category 1 - data available to support threatened or endangered status.
Category 2 - further research needed to support threatened or endangered status.
Category 3 - species no longer considered for listing as threatened or endangered.
[b]California Native Plant Society (CNPS), 1980.
List 1 - plants presumably extinct.
List 2 - plants very rare or rare that are also endangered.
List 3 - plants that are rare.
List 4 - plants rare in California, more common outside state.
[c]U.S. Fish and Wildlife Service - Federal Register Vol. 45, No. 242.
T = threatened - species is likely to become endangered in the near future.
E = endangered - species is in imminent danger of extinction in the wild.
[d]TPWD, 1985.
Threatened - species likely to become an endangered species within the foreseeable future throughout all or part of its range.
Endangered - species in danger of extinction throughout all or a significant part of its range.
[e]Texas - Confirmed occurrence for this species in one or more of the counties that the pipeline crosses.
[f]Texas - Possible for this species to occur in one or more of the counties that the pipeline crosses.
[g]California Department of Fish and Game, 1980.
Endangered - continued existence is jeopardized by one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease.
Rare - exists in such small numbers throughout its range that it may become endangered if its environment worsens.
[h]Threatened Native Wildlife in Arizona, 1983.
Group 1 - species suspected to be extinct in Arizona but that occur elsewhere.
Group 2 - species whose continued presence in Arizona is in jeopardy, and extirpation is probable if no recovery efforts are made.
Group 3 - species whose continued presence in Arizona could be in jeopardy in the foreseeable future; habitats are threatened for these species.
Group 4 - species for which there is a moderate threat to the habitats they occupy.
[i]Handbook of Species Endangered in New Mexico, 1979.
Endangered includes rare, local, peripheral, and/or declining species.
Group I - state endangered - species whose prospects of survival or recruitment in the state are in jeopardy.
Group II - state endangered - species whose prospects of survival or recruitment within the state may become in jeopardy in the foreseeable future.
[j]Texas - Probable for this species to occur in one or more of the counties that the pipeline crosses.

Table I.2-1 - Los Angeles-Long Beach Harbors:
Relative Abundance of Zooplankton Species

Species	Mean Concentration (m^3)	Proportion of Plankton (%)
Acartia tonsa	1,537.60	57.88
Podon polyphemoides	294.53	11.09
Paracalanus parvus	265.94	10.01
Larvaceans	152.18	5.73
Evadne nordmanni	124.82	4.70
Barnacle nauplii larvae	110.13	4.15
Corycaeus anglicus	41.90	1.58
Labidocera trispinosa	22.99	0.86
Oithona oculata	15.28	0.57
Crab zoea larvae	12.62	0.47
Oithona similis	11.38	0.43
Medusae	7.07	0.27
Chaetognaths	5.31	0.20
Fish eggs and larvae	5.03	0.19
Calanus helgolandicus	4.20	0.16
Tunicate tadpole larvae	4.19	0.16
Gastropod veliger larvae	3.37	0.13
Bryozoan cyphonautes larvae	3.31	0.12
Ophiuroid pluteus larvae	2.85	0.11
Polychaete trochophore larvae	2.40	0.09
Siphonophores	2.38	0.09
Harpacticoid copepods	2.25	0.08
Euterpina acutifrons	1.45	0.05
Penilia avirostris	1.33	0.05
Ctenocalanus vanus	1.14	0.04
Euphausids	0.91	0.03

Source: HEP, 1976.

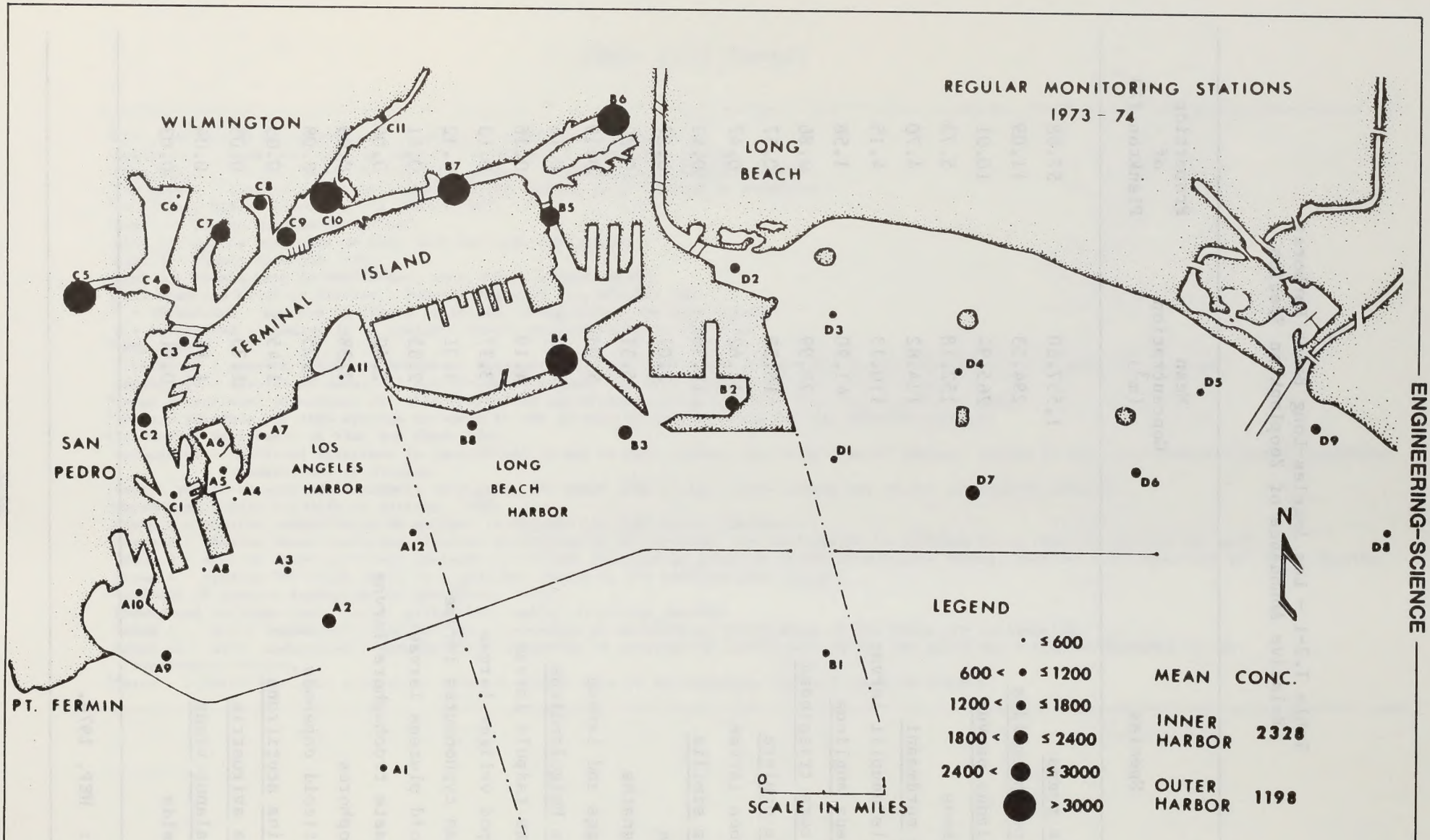


Figure I.2-1 - Mean Spatial Distribution of Acartia Tonsa (Copepod)
(HEP, 1976)

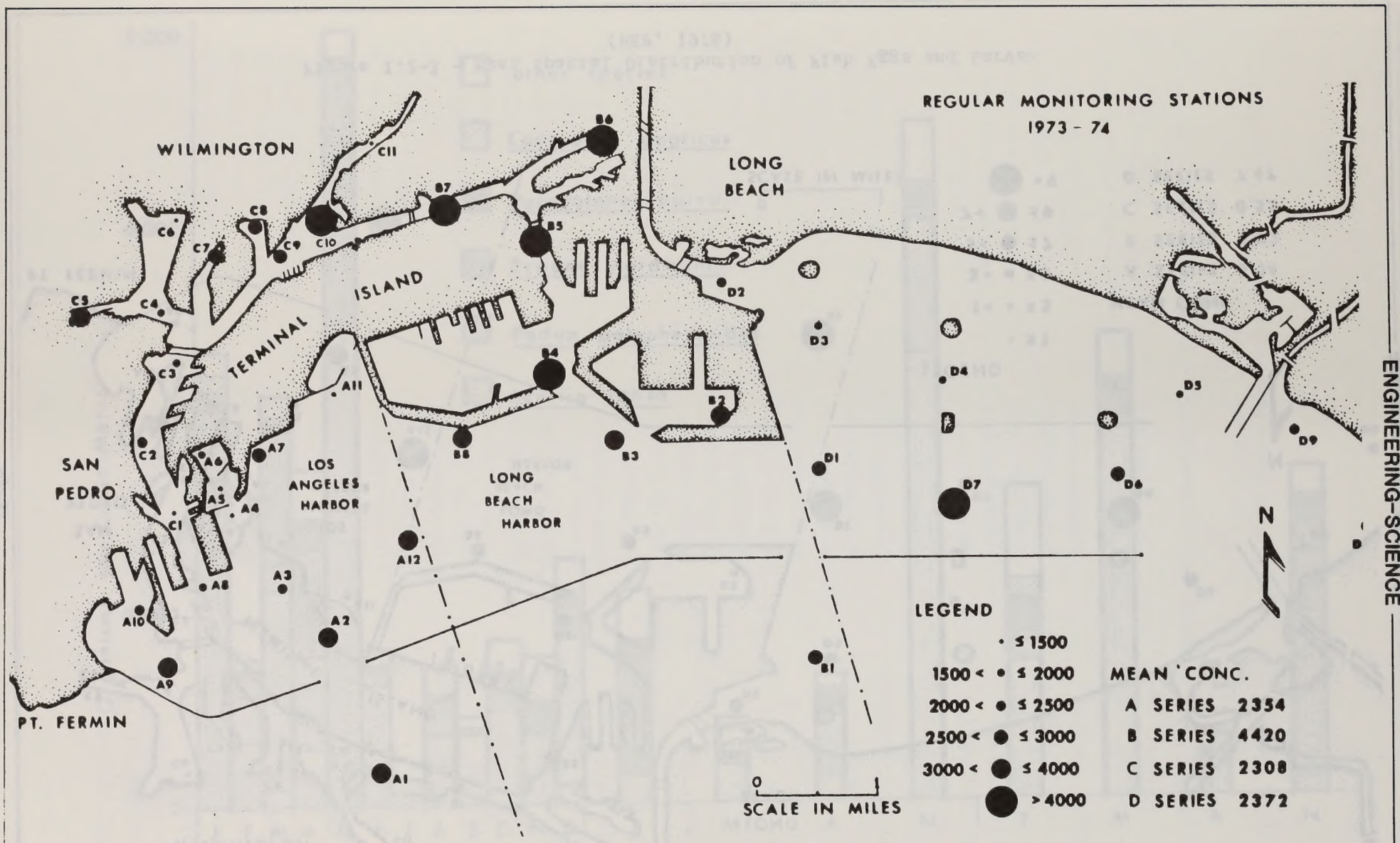


Figure I.2-2 - Mean Spatial Distribution of Total Zooplankton
(HEP, 1976)

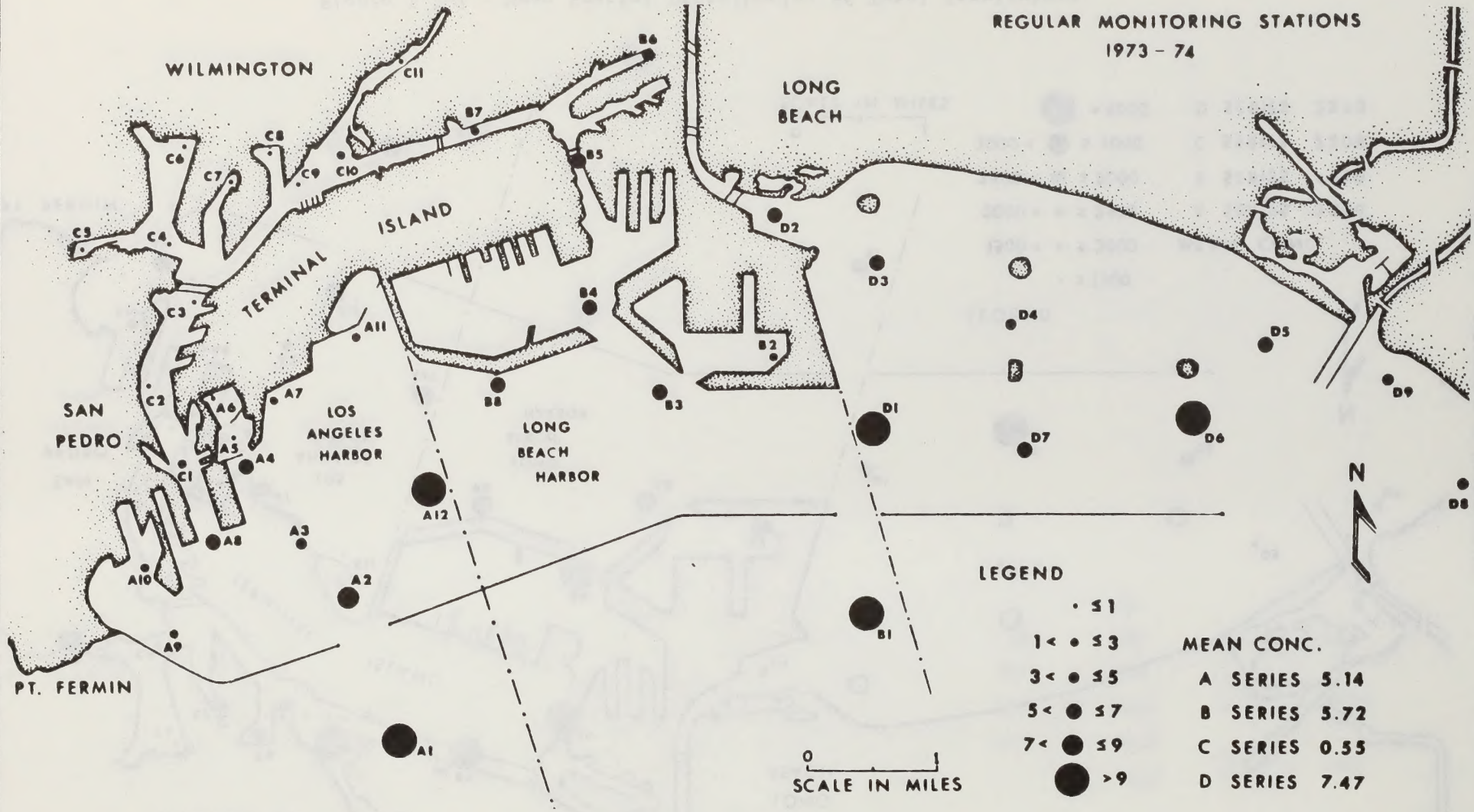


Figure I.2-3 - Mean Spatial Distribution of Fish Eggs and Larvae
(HEP, 1976)

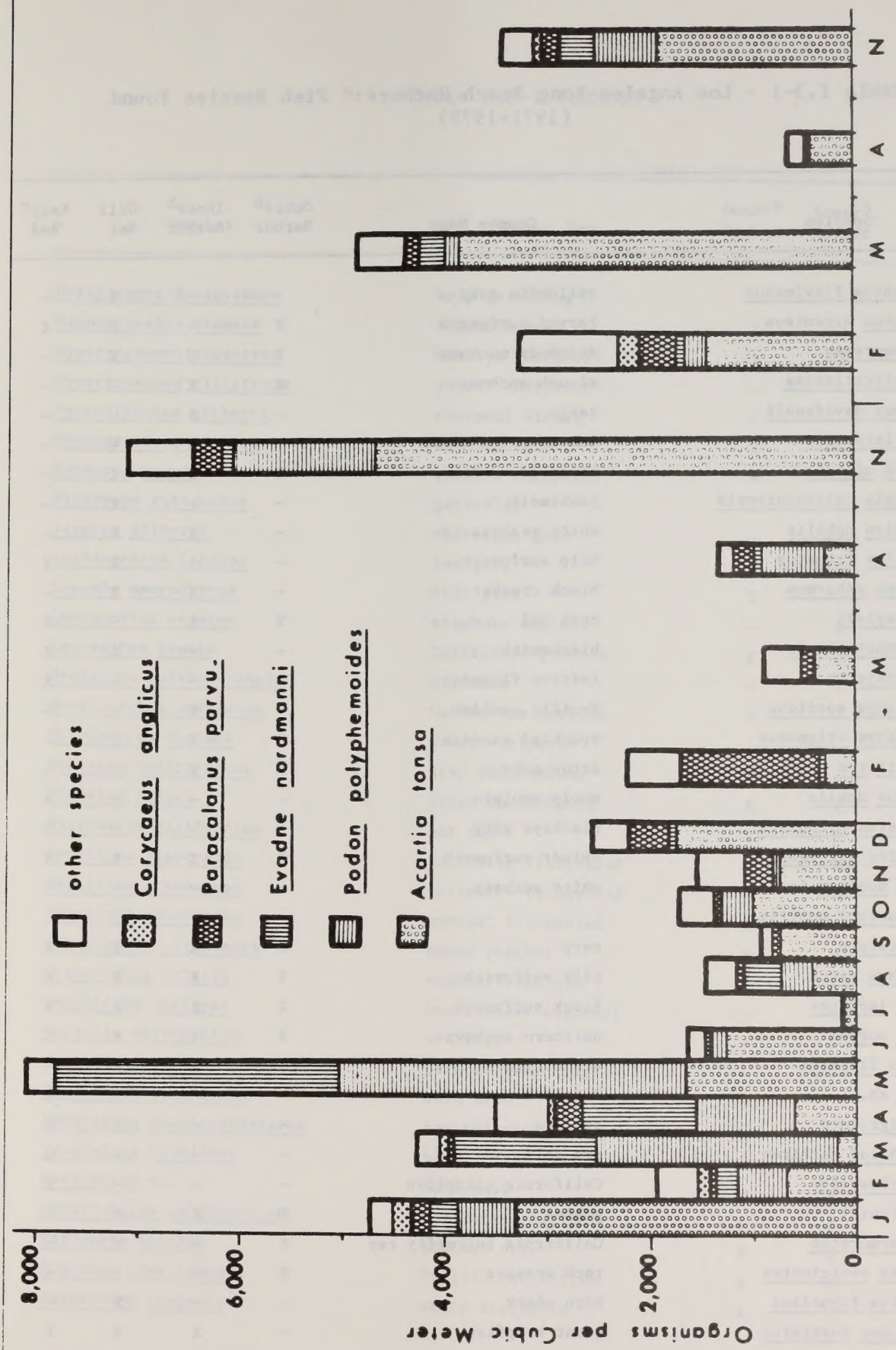


Figure I.2-4 - Mean Temporal Abundance of Zooplankton and Major Component Species (HEP, 1976)

Table I.3-1 - Los Angeles-Long Beach Harbors:[a] Fish Species Found (1971-1979)

Species	Common Name	Outer[b] Harbor	Inner[b] Harbor	Gill Net	Kelp[c] Bed
Acanthogobius flavimanus	yellowfin goby	-	-	X	-
Amphistichus argenteus	barred surfperch	X	-	X	X
Anchoa compressa	deepbody anchovy	X	X	X	-
Anchoa delicatissima	slough anchovy	X	X	-	-
Anisotremus davidsonii	sargo	-	X	-	-
Artedius lateralis	smoothhead sculpin	-	X	-	-
Atherinops affinis	topsmelt	X	X	X	-
Atherinopsis californiensis	jacksmelt	-	-	X	-
Atractoscion nobilis	white seabass	-	X	X	-
Brachyistius frenatus	kelp surfperch	-	-	X	X
Cheilotrema saturnum	black croaker	-	X	X	-
Chilara taylori	cusk eel	X	X	-	X
Chramis punctipinnis	blacksmith	-	-	X	X
Citharichthys sp.	lefteye flounder	-	-	-	X
Citharichthys sordidus	Pacific sanddab	-	X	-	-
Citharichthys stigmaeus	speckled sanddab	X	X	X	-
Clevelandia ios	arrow goby	X	X	-	-
Clinocottus analis	wooly sculpin	-	-	-	X
Coryphopterus nicholsii	blackeye goby	-	-	-	X
Cymatogaster aggregata	shiner surfperch	X	X	X	X
Cynoscian nobilis (= Atractoscion) nobilis	white seabass	-	-	-	-
Cyprinus carpio	carp	X	X	X	X
Damalichthys vacca	pile surfperch	X	X	X	X
Embiotoca jacksoni	black surfperch	X	X	X	X
Engraulis mordax	northern anchovy	X	X	X	X
Genyonemus lineatus	white croaker	X	X	X	-
Gibbonsia sp.	kelpfish	-	-	-	X
Girella nigricans	opaleye	-	-	X	X
Glyptocephalus zachirus	rex sole	-	-	-	0
Gobiesox rhessodon	California clingfish	-	-	-	X
Gobiidae (unid)	gobies	X	X	-	-
Gymnura marmoratus	California butterfly ray	X	-	-	-
Halichoeres semicinctus	rock wrassee	X	-	-	-
Heterodontus francisci	horn shark	-	-	X	-
Heterostichus rostratus	giant kelpfish	-	X	X	X

Table I.3-1 (Contd)

Species	Common Name	Outer[b] Harbor	Inner[b] Harbor	Gill Net	Kelp[c] Bed
Hexagrammos decagrammus	kelp greenling	-	-	-	X
Hippoglossina stamata	bigmouth sole	X	X	-	-
Hyperprosopon argenteum	walleye surfperch	X	X	X	-
Hyperprosopon ellipticum	silver surfperch	-	-	X	-
Hypsoblennius gilberti	rockpool blenny	-	-	-	X
Hypsopsetta guttulata	diamond turbot	X	-	-	X
Hypsurus caryi	rainbow surfperch	-	-	-	X
Hypsypops rubicundus	garibaldi	-	-	-	X
Ilyprus gilberti	cheekspot goby	-	X	-	-
Lepidogobius lepidus	bay goby	X	X	-	-
Lepomis macrochirus	blue gill	X	-	-	-
Leptocottus armatus	staghorn sculpin	-	X	-	X
Leuresthes tenuis	California grunion	X	X	-	-
Medialuna californiensis	halfmoon	-	-	-	X
Menticirrhus undulatus	California corbina	-	-	X	-
Micrometrus minimus	dwarf surfperch	-	-	X	-
Mustelus californicus	gray smoothhound	-	-	X	-
Mustelus henlei	brown smoothhound	X	X	X	-
Myliobatis californica	bat ray	X	X	X	-
Neoclinus blanchardi	sarcastic fringehead	-	-	-	X
Neoclinus stephensae	yellowfin fringehead	-	-	-	X
Neoclinus uninotatus	onespot fringehead	X	X	-	-
Odontopyris trispinosa	pygmy poacher	X	X	-	-
Orthonopias triacis	snubnose sculpin	-	-	-	X
Otophidium scrippsi	basketweave cusk-eel	-	X	-	-
Oxyjulis californica	senorita	-	-	-	X
Oxylebius pictus	painted greenling	-	-	-	X
Paralabrax clathratus	kelp bass	-	-	X	X
Paralabrax maculatofasiatus	spotted sand bass	X	-	X	-
Paralabrax nebulifer	barred sand bass	X	X	X	X
Paralabrax sp.	sand bass	-	-	-	X
Paralichthys californicus	California halibut	X	X	X	-
Parophrys vetulus	English sole	X	X	-	-
Peprilus simillimus	Pacific butterfish	X	X	X	-
Phanerodon furcatus	white surfperch	X	X	X	X

Table I.3-1 (Contd)

Species	Common Name	Outer[b] Harbor	Inner[b] Harbor	Gill Net	Kelp[c] Bed
Pimelometopon pulchrum	sheephead	-	-	-	X
Platichthys stellatus	starry flounder	X	-	-	-
Pleuronectidae	righteye flounders	-	-	-	X
Pleuronichthys coenosus	c-o turbot	-	-	-	X
Pleuronichthys decurrens	curlfin turbot	-	X	X	-
Pleuronichthys ritteri	spotted turbot	-	X	-	-
Pleuronichthys verticalis	hornyhead turbot	X	X	X	-
Porichthys myriaster	specklefin midshipman	X	X	X	-
Porichthys notatus	plainfin midshipman	-	X	-	-
Psettichthys melanostictus	sand sole	-	-	-	X
Rhacochilus toxotes	rubberlip surfperch	-	X	X	-
Rhinobatos productus	shovelnose guitarfish	X	X	-	-
Roncador sternsii	spotfin croaker	-	-	X	-
Sarda chiliensis	Pacific bonito	-	-	X	-
Sardinops sagax caeruleus	Pacific sardine	-	-	X	-
Sciaenidae (unid)	drums	-	-	-	X
Scomber japonicus	Pacific mackerel	-	-	X	-
Scorpaena guttata	sculpin or spotted scorpionfish	X	X	X	X
Scorpaenichthys marmoratus	cabezon	-	-	-	X
Sebastes atrovirens	kelp rockfish	-	-	-	X
Sebastes auriculatus	brown rockfish	X	X	X	-
Sebastes dalli	calico rockfish	X	X	-	X
Sebastes goodei	chilipepper	-	-	X	-
Sebastes melanops	black rockfish	-	-	X	-
Sebastes miniatus	vermilion rockfish	X	X	-	-
Sebastes mystinus	blue rockfish	-	X	X	X
Sebastes paucispinis	bocaccio	X	X	X	-
Sebastes rastrelliger	grass rockfish	X	-	-	-
Sebastes saricola	stripetail rockfish	X	X	-	X
Sebastes semicintus	halfbanded rockfish	-	X	-	-
Sebastes serranoides	olive rockfish	X	X	X	X
Sebastes serriceps	treefish	-	-	-	X
Sebastes sp.	rockfish	-	X	-	X
Seriphus politus	queenfish	X	X	X	X

Table I.3-1 (Contd)

Species	Common Name	Outer[b] Harbor	Inner[b] Harbor	Gill Net	Kelp[c] Bed
Sphyraena argentea	California barracuda	-	-	X	-
Squalus acanthias	spiny dogfish	X	X	X	-
Symphurus atricauda	California tonguefish	X	X	X	-
Synodus lucioceps	California lizardfish	X	X	X	-
Syngnathus sp.	pipefish	X	X	-	-
Torpedo californica	Pacific electric ray	X	-	-	-
Trachurus symmetricus	jack mackerel	-	X	X	-
Triakis semifasciata	leopard shark	-	-	X	-
Tridentiger trigonocephalus	chameleon goby	-	-	-	*
Umbrina roncador	yellowfin croaker	-	-	-	X
Urolophus halleri	round stingray	X	X	X	-
Xystreurys liolepis	fantail sole	X	X	-	-
Zaniolepis frenata	shortspine combfish	X	-	-	-

[a]X = occurrence
0 = outside breakwater
* = Cabrillo area
- = not observed
[b]Caught by Otter Trawl
[c]Observed in kelp bed beside San Pedro breakwater, unless otherwise noted.
Source: FWS, 1985; COE, 1984d (pp. 3-I-1 to -3).

Table I.3-2 - Los Angeles-Long Beach Harbors: Seventeen Species Collected During 1983-1984 Survey That Previously Were Not Reported in the Complex

Species	Common Name	Gear Type		
		Otter Trawl	Beach Seine	Purse Seine
Raja binoculata	big skate	X	-	-
R. inornata	California skate	X	-	-
Platyrhinoidis triseriata	thornback	X	-	-
Dorosoma petenense	threadfin shad	X	X	-
Fodiator acutas	sharpchin flyingfish	X	-	-
Xenistius californiensis	salema	X	-	X
Hypsoblennius gentilis	bay blenny	X	-	-
H. jenkensi	mussel blenny	-	-	X
Albula vulpes	bonefish	-	X	-
Fundulus parvipinnis	California killifish	-	X	-
Mugil cephalus	striped mullet	-	X	-
Gillichthys mirabilis	longjaw mudsucker	-	X	-
Quietula y-cauda	shadow goby	-	X	-
Tilapia mossambica	mozambique tilapia	-	X	-
Tilapia spp.	tilapia	-	X	-
Etrumeus teres	round herring	-	-	X
Strongylura exilis	California needlefish	-	-	X

Source: MBC, 1984.

Table I.3-3 - Los Angeles-Long Beach Harbors: Major Commercial and Game Fishes

Common Name	Species	Use	
		Game	Commercial
jacksmelt	Atherinopsis californiensis	X	-
white seabass	Atractoscion nobilis	X	-
Pacific sanddab	Citharichthys sordidus	X	-
speckled sanddab	Citharichthys stigmaeus	X	-
black perch	Embiotoca jacksoni	X	-
northern anchovy	Engraulis mordax	X	X
white croaker	Genyonemus lineatus	X	-
opaleye	Girella nigricans	X	-
giant kelpfish	Heterostichus rostratus	X	-
halfmoon	Medialuna californiensis	X	-
dover sole	Microstomus pacificus	-	X
kelp bass	Paralabrax clathratus	X	-
spotted sand bass	Paralabrax macilatofasciatus	X	-
barred sand bass	Paralabrax nebulifer	X	-
California halibut	Paralichthys californicus	X	X
Pacific sardine	Sardinops sagax	-	X
chub mackerel	Scomber japonicus	X	X
California scorpion fish	Scorpaena guttata	X	-
cabezon	Scorpaenichthys masmoratus	X	-
kelp rockfish	Sebastes atrovirens	X	-
brown rockfish	Sebastes auriculatus	X	-
chili pepper	Sebastes goodei	X	-
vermilion rockfish	Sebastes miniatus	X	-
blue rockfish	Sebastes mystinus	X	-
bocaccio	Sebastes paucispinis	X	X
grass rockfish	Sebastes rastrelliger	X	-
olive rockfish	Sebastes serranoides	X	-
treefish	Sebastes serriceps	X	-
queenfish	Seriphus politus	X	-
Pacific barracuda	Sphyraena argentea	X	X
California lizardfish	Synodus lucioceps	X	-
jack mackerel	Trachurus symmetricus	-	X

Source: Klingbeil, 1984; Hewitt and Brewer, 1983; Mearns et al., 1980; Schultze, 1983; Plummer et al., 1983; Wine, 1982; Roberto et al., 1984.

Table I.3-4 - Los Angeles-Long Beach Harbors: Habitat Preference[a] of 30 Abundant Fish

Common Name	Species	Pelagic	Rocky	Demersal[b]	Nutrient Enrichment	Schooling	Harbor Zone
northern anchovy	Engraulis mordax	X	-	-	X	X	A
white croaker	Genyonemus lineatus	X	-	-	X	-	A
speckled sanddab	Citharichthys stigmaeus	-	-	X	-	-	B
California tonguefish	Symphurus atricauda	-	-	X	-	-	B
queenfish	Seriphus politus	-	-	X	-	-	-
white seaperch	Phanerodon furcatus	-	-	X	-	-	-
shiner perch	Cymatogaster aggregata	-	X	-	-	-	-
bay goby	Lipidogobius lepidus	-	X	X	-	-	-
specklefin midshipman	Porichthys myriaster	-	X	X	-	-	-
horneyhead turbot	Pleuronichthys verticalis	-	-	X	-	-	I
calico rockfish	Sebastes dalli	-	-	X	-	-	B
barred sand bass	Paralabrax nebulifer	-	X	X	-	-	-
walleye surfperch	Hyperprosopon argenteum	-	X	X	-	-	-
kelp bass	Paralabrax clathratus	-	X	X	-	-	-
Pacific pompano	Peprilus simillimus	-	-	-	-	X	-
California halibut	Paralichthys californicus	-	X	X	-	-	B
black perch	Embiotaca jacksoni	-	X	X	-	X	-
California lizardfish	Synodus lucioceps	-	-	-	-	-	-
California corbina	Menticirrhus undulatus	-	-	X	-	-	-
olive rockfish	Sebastes serranoides	-	X	-	-	-	-
jacksmelt	Atherinopsis californiensis	-	-	X	X	X	-
pile perch	Rhacochilus vacca	-	-	-	-	-	I
bat ray	Myliobatis californica	-	X	X	-	-	-
Pacific bonito	Sarda chiliensis	X	-	-	-	X	-
brown smoothhound	Mustelus henlei	X	-	-	-	-	-
Pacific barracuda	Sphyraena argentea	X	-	-	-	X	-
topsmelt	Atherinops affinis	-	X	X	-	X	-
gray smoothhound	Mustelus californicus	X	-	-	-	-	-
jack mackerel	Trachurus symmetricus	X	-	-	-	X	-
Pacific sardine	Sardinops sagax	X	-	-	-	X	-

[a] A = all zones
B = San Pedro Bay
I = inner harbor
X = habitat preference

[b] Demersal = algal beds, soft bottom

Source: Species list compiled from Tables I.3-5 and I.3-6 and based on available information from Fitch, 1958; Baxter and Duffy, 1960.

Table I.3-5 - Los Angeles-Long Beach Harbors: 16 Most Abundant Species Collected by Otter Trawl in the Major Studies[a] of Juvenile-Adult Fish Populations

Species	1973	1974	1975	1976	1976	1977	1977	1978	1979	1979	1980	1982
Genyonemus lineatus[b]	17.6	52.4	55.8	61.1	55.5	41.6	21.2	49.0	17.3	52.4	31.1	50.4
Seriphus politus[b]	1.7	3.8	3.0	5.1	3.7	7.9	11.4	19.0	32.9	4.7	6.2	29.8
Phanerodon furcatus[b]	7.5	3.6	2.1	3.8	7.2	3.4	29.8	2.2	2.7	1.4	20.5	1.8
Engraulis mordax[b]	-	17.1	6.7	15.2	16.0	36.0	-	14.9	41.2	2.5	19.2	1.4
Symphurus atricauda	19.4	8.9	3.2	4.2	5.7	4.1	-	4.2	-	26.5	5.1	1.0
Citharichthys stigmaeus	33.1	6.5	1.0	1.0	1.3	-	-	-	-	6.7	-	-
Cymatogaster aggregata[b]	8.0	3.7	1.7	2.9	4.6	2.4	3.8	1.6	1.8	-	5.2	1.0
Lepidogobius lepidus	1.7	-	25.5	4.4	-	1.0	-	-	-	-	-	0.4
Porichthys myriaster[b]	2.4	-	-	-	-	-	-	-	-	-	-	1.1
Pleuronichthys verticalis	1.7	-	-	-	-	-	-	-	-	-	-	-
Sebastes dalli	-	-	-	-	4.2	2.0	-	1.4	-	-	-	-
Paralabrax nebulifer	-	-	-	-	-	-	6.8	-	-	-	-	0.6
Hyperprosopon argenteum[b]	-	-	-	-	-	-	4.1	-	-	-	-	0.9
Paralabrax clathratus	-	-	-	-	-	-	3.5	-	-	-	-	-
Peprilis simillimus[b]	-	-	-	-	-	-	2.0	2.8	1.8	-	-	-
Paralichthys californicus[b]	-	-	-	-	-	-	2.6	-	-	-	3.0	5.4
Total	93.1	96.0	99.0	97.7	98.2	98.4	85.2	95.1	97.7	94.2	90.3	93.8

[a]For specific references, see COE, 1984d, p. 3-84.
[b]Most abundant species common to both gill net and otter trawl surveys.
Source: COE, 1984d, p. 3-84; FWS, 1985.

Table I.3-6 - Los Angeles-Long Beach Harbors: 23 Most Abundant Species Collected by Gill Net in the Studies[a] of Juvenile-Adult Fish Populations

Species	% of Total Catch								
	1975	1976	1976	1977	1977	1977	1979	1980	1982
Genyonemus lineatus	24.7	22.6	19.3	31.2	29.7	34.3	15.9	23.0	10.2
Engraulis mordax	17.9	12.0	20.0	3.1	-	-	-	-	0.2
Cymatogaster aggregata	11.9	16.6	-	17.2	-	11.9	-	-	-
Seriphus politus	11.6	17.3	8.8	17.4	3.3	18.9	15.2	12.2	7.8
Phanerodon furcatus	8.5	9.6	29.1	10.2	26.2	11.4	6.7	22.8	4.1
Porichthys myriaster	4.3	-	-	-	-	1.1	-	-	0.3
Embiotoca jacksoni	4.2	2.8	4.6	2.3	-	3.7	-	11.0	1.5
Hyperprosopon argenteum	2.7	11.5	2.5	3.5	10.8	6.0	-	5.9	1.3
Synodus lucioceps	2.2	-	-	-	-	-	-	1.3	-
Menticirrhus undulatus	1.1	-	-	1.2	-	-	6.4	1.3	7.9
Sebastes serranoides	-	-	3.5	-	-	-	-	-	-
Peprilus simillimus	-	-	-	-	26.7	-	-	-	-
Atherinopsis californiensis	-	-	-	-	-	-	26.0	4.8	49.2
Rhacochilus vacca	-	-	-	2.7	-	1.4	6.4	4.8	1.1
Myliobatis californica	-	-	-	-	-	-	4.7	-	1.1
Sarda chiliensis	-	-	-	-	-	-	2.0	2.0	0.5
Mustelus henlei	-	-	-	1.2	-	-	-	-	0.3
Sphyraena argentea	-	-	-	-	-	-	2.0	-	0.6
Atherinops affinis	-	-	-	4.6	-	-	-	-	1.4
Paralichthys californicus	-	-	-	-	-	-	-	3.6	0.4
Mustelus californicus	-	-	-	-	-	-	-	1.1	3.3
Trachurus symmetricus	-	-	-	-	-	2.9	-	-	0.3
Sardinops sagax	-	-	-	-	-	1.4	-	-	0.5
Total	89.0	92.4	87.8	94.6	96.7	94.6	85.3	93.8	91.0

[a]For specific references, see COE, 1984d, p. 3-85.
Source: COE, 1984d, p. 3-85; FWS, 1985.

Table I.3-7 - Los Angeles-Long Beach Harbors:
Known Trophic Interactions of Some Fish

Prey	Fish		Predator
	Common Name	Species	
Phytoplankton, zooplankton (copepods, euphausids) small fish	Northern anchovy	Engraulis mordax	Least tern, speckled sanddab, kelp bass, California habitat, California barracuda, jack mackerel
Bottom dwelling polychaetes, barnacles, copepodo, crabs clams, shrimp, detritus	White croaker	Genyonemus lineatus	Black see bass, bluefin tune, California habitat, Pacific bottle-nose dolphin
Tunicates, larval and adult anchovy, polychaetes, crustaceans, shrimp	Speckled sanddab	Citharichthys stigmaeus	Crabs, cormorants, fish, seal, sea lion
Polychaetes, crustaceans	California tonguefish	Symphurus atricauda	Birds (cormorant), flatfish
Very small fish, barnacles, invertebrates	Shiner surfperch	Cymatogaster aggregata	Marine Mammals. All carnivorous fish, sea birds
Crustaceans (mysids), squid, small fish, octopi	Speckled midshipman	Porichthys myriaster	Giant sea bass, sea lion, porpoise
Polychaetes, crustaceans	Bay goby	Lipidogobius lepidus	Halibut, sand bass, sculpin, shorebirds
Diverse feeder	Calico rockfish	Sebastes dalli	Rockfish, albacore, yellowfin tuna, salmon, seabirds
Amphipods, mysids, brachyuran crabs, mollusks, epibenthic fish, octopi	Barred sand bass	Paralabrax nebulifer	-
Small crustaceans	Walleye surfperch	Hyperprosopon argenteum	Kelp bass, sculpin, California halibut
Crustaceans (mysids), perch, anchovy, Pacific butterfish	Kelp bass	Paralabrax clathratus	-
Small crustaceans	Pacific butterfish	Peprilus simillimus	Kelp bass, barracuda, California halibut
Mysids, northern anchovy	California halibut	Paralichthys californicus	-

Table I.3-7 (Contd)

Prey	Fish		Predator
	Common Name	Species	
Worms, small crustaceans, fish parasites, mollusks	Black surfperch	Embiotaca jacksoni	Fish (electric ray, etc.)
Crustaceans, sandy benthic infauna, sand crabs	California corbina	Menticirrhus undulatus	-
Shrimp, crabs, squid, fish	Olive rockfish	Sebastes serranoides	Juvenile albacore, rockfish, yellowfin tuna, salmon, seabirds
Small crustaceans, waste effluent	Jacksmelt	Atherinopsis californiensis	Fish (yellowtail, kelp bass)
In bays: Crustaceans: shrimp, crabs Mollusks: clams, oysters Open ocean: abalone, snails	Bat ray	Myliobatis californica	Unknown (sharks?)
Small fish (anchovy, sardine), squid	Pacific bonito	Sarda chiliensis	Juveniles: sea lions, sharks, white sea bass, yellowtail, Adult: large fish (morin, tuna, giant sea bass)
Small fish (anchovy, sardine, grunion, Pacific mackerel	California barracuda	Sphyraena argentea	Large fish (giant sea bass), sea lion, porpoise, dolphin
Kelpfly larvae, planktonic crustaceans, algae, polychaetes	Topsmelt	Atherinops affinis	Variety of seabirds, predatory fish
Pteropods, crustaceans (euphausids, large copepods, anchovy, lanternfish, juvenile squid	Jack mackerel	Trachurus symmetricus	Fish (yellowtail, white sea bass, giant sea bass albacore), seals, sea lion, poipoise, large predators (angel shark, blue shark, electric ray)

- = Data not available.
( ) = Preferred food within trophic level.
Source: Species list compiled from Tables I.3-5 and I.3-6 and based on available information from Fitch (1958); Baxter and Duffy (1960).

Table I.3-8 - Los Angeles-Long Beach Harbors: Most Abundant Fish Larvae Collected in Ichthyoplankton Studies

Survey	Species	Total Catch (%)
HEP, 1976		
	Engraulis mordax	38.4
	Hypsoblennius spp.	20.4
	Sciaenidae	17.2
	Sebastes spp.	8.4
	Gobiidae	5.3
HEP, 1979		
	Genyonemus lineatus	54.1
	Engraulididae	27.8
	Gobiidae	7.2
	Hypsoblennius spp.	5.4
	Seriphus politus	1.0
SCOSC, 1980 - Cabrillo Beach		
	Engraulis mordax	53.5
	Clevelandia ios	15.9
	Genyonemus lineatus	10.2
	Gobiid I	7.1
SCOSC, 1980 - West Channel/Watchorn Basin		
	Clevelandia ios	31.0
	Gobiid II	25.8
	Gobiid I	18.7
	Atherinopsis californiensis	6.5
	Genyonemus lineatus	4.5
	Engraulis mordax	3.2
SCOSC, 1982 - Shallow Water/Seaplane Anchorage		
	Gobiidae	69.6
	Engraulis mordax	21.0
	Leuresthes tenuis	1.6
	Hypsoblennius sp.	1.5
	Genyonemus lineatus	1.2
	Genyonemus/Seriphus	1.2

Source: COE, 1984d, p. A-1-160.

Table I.3-9 - Los Angeles-Long Beach Harbors: Master Species List of Fish Larvae and Eggs Collected

Species	HEP		SCOSC	
	1976	1979	1980	1982
Unknown Agonid	X	-	-	-
Anisotremus davidsonii	X	-	-	-
Unknown Atherinids	X	X	-	-
Atherinops affinis	-	-	X	X
Atherinopsis californiensis	-	-	X	X
Brosmophycis marginata	X	-	-	-
Cheilotrema saturnum	-	X	X	X
Chilara taylori	-	X	-	-
Chromis punctipinnis	X	X	-	-
Citharichthys sp.	X	X	X	X
Clevelandia ios	-	-	X	-
Clinidae	X	X	-	-
Clinocottus analis	-	-	X	-
Unknown Cottid	X	X	X	-
Engraulis mordax	X	X	X	X
Genyonemus lineatus	-	X	X	X
Genyonemus/Seriphus	-	-	-	X
Gibbonsia sp.	-	-	X	X
Gillichthys mirabilis	-	-	X	-
Gobiidae	X	X	X	X
Gobiesox rhessodon	-	X	X	X
Gobiesox sp.	X	-	X	X
Heterostichus rostratus	-	-	X	X
Hippoglossina stomata	-	-	X	-
Hypsoblennius gentilis	-	-	X	-
Hypsoblennius sp.	X	X	X	X
Hysopsetta guttulata	X	X	X	X
Hypsypops rubicundus	X	X	-	-

Table I.3-9 (Contd)

Species	HEP		SCOSC	
	1976	1979	1980	1982
Ilypnus gilberti	-	-	X	-
Unknown Labridae	X	-	-	-
Leptocottus armatus	-	-	X	-
Leuresthes tenuis	-	-	X	X
Merluccius productus	-	X	-	-
Oligocottus/Clinocottus	-	-	-	X
Ophidion scrippsae	-	X	-	-
Oxyjulis californica	-	X	-	X
Paraclinus integripinnis	-	-	-	X
Paralabrax clathratus	-	-	X	-
Paralabrax sp.	X	X	-	-
Paralichthys californicus	X	X	X	X
Parophrys vetulus	X	-	X	-
Peprilus simillimus	-	X	-	-
Pleuronectidae	-	-	X	-
Pleuronichthys coenosus	-	-	X	-
Pleuronichthys decurrens	X	-	X	-
Pleuronichthys ritteri	-	X	X	X
Pleuronichthys verticulis	X	X	X	X
Pleuronichthys sp.	-	-	-	X
Sardinops sagax caeruleus	-	-	X	X
Sciaenidae	X	-	X	-
Scomber japonicus	-	-	-	X
Scorpaenichthys marmoratus	-	X	-	-
Sebastes sp.	X	X	X	-
Seriola/Trachurus	-	X	-	-
Seriphus politus	-	X	X	X
Unknown Serranidae	-	-	X	-
Sphyraena argentea	X	X	-	-

Table I.3-9 (Contd)

Species	HEP		SCOSC	
	1976	1979	1980	1982
Stenobrachius leucopsarus	-	X	-	-
Symphurus atricauda	-	X	X	X
Syngnathus californiensis	-	-	X	-
Syngnathus leptorhynchus	-	-	X	X
Syngnathus sp.	X	-	-	-
Synodus lucioceps	-	X	-	-
Trachurus symmetricus	-	-	-	X
Triphoturus mexicanus	-	X	-	-
Ulivcola sanctaerosae	-	-	X	-
Xystreurys liolepis	X	-	-	-
Unknown eggs and larvae	X	X	X	X

Source: HEP, 1976, 1979; SCOSC, 1980, 1982.

Table I.3-10 - Los Angeles-Long Beach Harbors: Dominant Ichthyoplankton Taxa Collected During a 12-Month Sampling Period

Rank	Species	Species	Species
	March	April	May
1	Genyonemus lineatus	Ilypnus gilberti	Ilypnus gilberti
2	Engraulis mordax	Clevelandia ios	Engraulis mordax
3	Ilypnus gilberti	Genyonemus lineatus	Hypsoblennius spp.
4	Clevelandia ios	Engraulis mordax	Clevelandia ios
5	Hypsoblennius spp.	Atherinopsis californiensis	Genyonemus lineatus
	June	July	August
1	Hypsoblennius spp.	Hypsoblennius spp.	Hypsoblennius spp.
2	Engraulis mordax	Ilypnus gilberti	Ilypnus gilberti
3	Genyonemus lineatus	Sardinops sagax	Lepidogobius lepidus
4	Clevelandia ios	Engraulis mordax	Engraulis mordax
5	Seriphus politus	Seriphus politus	Gibbonsia sp. A
	September	October	November
1	Hypsoblennius spp.	Sardinops sagax	Ilypnus gilberti
2	Ilypnus gilberti	Ilypnus gilberti	Engraulis mordax
3	Sardinops sagax	Engraulis mordax	Hypsoblennius spp.
4	Lepidogobius lepidus	Hypsoblennius spp.	Lepidogobius lepidus
5	Gobiidae unident.	Lepidogobius lepidus	Gobiidae unident.
	December	January	February
1	Engraulis mordax	Lepidogobius lepidus	Lepidogobius lepidus
2	Lepidogobius lepidus	Engraulis mordax	Engraulis mordax
3	Genyonemus lineatus	Genyonemus lineatus	Genyonemus lineatus
4	Ilypnus gilberti	Ilypnus gilberti	Ilypnus gilberti
5	Gobiiade unident.	Gobiidae unident.	Gobiidae unident.

Source: MBC, 1984.

Table I.3-11 - Los Angeles-Long Beach Harbors: Larval Fish Taxa Captured Along the 8-, 15-, 22-, and 36-m Isobaths on the Open Coast and at Four Stations and Listed by Mean Density (N = sample size)

Open Coast (N = 309)				Los Angeles-Long Beach Harbor (N = 32)			
Species	No. of occ.	Avg No./ m^3	Avg No./ m^2	Species	No. of occ.	Avg No./ m^3	Avg No./ m^2
Engraulis mordax	289	1.36	31.67	Engraulis mordax	27	0.54	8.17
Genyonemus lineatus	173	0.45	8.97	Genyonemus lineatus	20	0.42	6.62
Seriphus politus	131	0.14	2.18	Clevelandia ios	23	0.20	2.88
Sebastes spp.	89	0.12	2.07	Hypsoblennius spp.	18	0.18	2.70
Ilypnus gilberti	85	0.11	0.96	Seriphus politus	11	0.15	2.44
Scomber japonicus	11	0.054	1.05	Gobiidae	7	0.14	2.10
Paralichthys californicus	131	0.038	0.77	Ilypnus gilberti	12	0.025	0.37
Lepidogobius lepidus	67	0.037	0.38	Lepidogobius lepidus	10	0.023	0.33
Hypsoblennius spp.	113	0.033	0.55	Sebastes spp.	8	0.021	0.36
Clevelandia ios	92	0.025	0.47	Paralichthys californicus	7	0.019	0.33
Paralabrax spp.	42	0.014	0.31	Coryphopterus nicholsi	8	0.014	0.25
Citharichthys spp.	80	0.012	0.26	Paralabrax spp.	3	0.014	0.23
Pleuronichthys verticalis	60	0.0093	0.21	Citharichthys spp.	11	0.014	0.21
Gobiidae	20	0.0083	0.078	Pleuronichthys ritteri	5	0.011	0.17
Stenobrachius leucopsarus	47	0.0074	0.18	Symphurus atricauda	3	0.011	0.17
Heterostichus rostratus	20	0.0073	0.066	Pleuronichthys verticalis	5	0.0077	0.13
Triphoturus mexicanus	47	0.0067	0.16	Sciaenidae	5	0.0068	0.104
Hypsopsetta guttulata	41	0.0052	0.075	Hypsopsetta guttulata	6	0.0067	0.087
Clinidae Type A	10	0.0052	0.048	Peprilus simillimus	1	0.0060	0.10
Pleuronichthys ritteri	46	0.0052	0.13	Pleuronectidae	3	0.0052	0.091
Leuresthes tenuis	21	0.0048	0.049	Triphoturus mexicanus	2	0.0048	0.079
Parophrys vetulus	32	0.0047	0.13	Gobiesox rhessodon	4	0.0043	0.068
Symphurus atricauda	11	0.0042	0.094	Parophrys vetulus	4	0.0033	0.056
Clinidae	17	0.0040	0.046	Pleuronectiformes	2	0.0030	0.052
Gibbonsia spp.	22	0.0037	0.044	Cottidae	1	0.0029	0.049
Atherinopsis californiensis	13	0.0035	0.033	Clinidae Type A	3	0.0027	0.033

Source: Brewer, 1983.

Table I.3-12 - Adjacent to Los Angeles-Long Beach Harbors: Most Numerically Abundant Fish Species Collected in the Adjacent Neritic (10-30 m) Water Area

Species	Total Catch (%)
Citharichthys stigmaeus	39.5
Symphurus atricauda	22.2
Genyonemus lineatus	9.8
Phanerodon furcatus	7.7
Cymatogaster aggregata	3.3
Total	82.5

Source: COE, 1984d, p. A-1-130.

Table I.3-13 - Outer Harbor: Most Abundant Fish Species Collected[a]

Species	Total Catch (%)								
	1973	1974	1974	1975	1976	1976	1977	1978	1979
Citharichthys stigmaeus	33.1	6.5	-	-	-	-	-	-	6.7
Symphurus atricauda	19.4	8.9	12.9	16.1	13.3	5.7	13.7	27.6	26.5
Genyonemus lineatus	17.6	52.4	61.0	43.5	46.4	55.5	53.5	53.5	52.4
Cymatogaster aggregata	8.0	3.7	-	7.7	5.4	4.6	-	-	-
Phanerodon furcatus	7.5	3.6	7.1	10.5	8.4	7.2	3.9	6.0	1.4
Porichthys myriaster	2.4	-	-	-	-	-	-	-	-
Sebastes sp.	2.1	-	-	-	6.2	4.2	-	-	-
Engraulis mordax	-	17.1	2.2	5.9	7.0	16.0	5.5	2.0	2.5
Seriphus politus	-	3.8	2.0	4.8	4.0	-	15.0	-	4.7
Peprilus simillimus	-	-	-	-	-	-	-	-	-
Lepidogobius lepidus	-	-	4.4	-	-	-	-	-	-
Total (%)	90.1	96.0	89.6	88.5	90.7	93.2	91.6	93.0	94.2
Average Shannon-Wiener Diversity Index	-	1.29	1.25	1.23	1.28	1.25	1.21	1.30	-
Average Species Richness (No. of species/trawl)	-	10.0	7.2	7.6	9.3	6.6	8.9	11	6.0
Average Density (No. of fish/m^2)	0.08	0.20	0.07	0.06	0.16	0.13	0.17	0.12	0.03

[a]For specific references, see COE, 1984d, p. A-1-121.
Source: COE, 1984d, p. A-1-121.

Table I.3-14 - Inner Harbor: Most Numerically Abundant Fish Species Collected

Species	Total Catch (%) 1974-1976	1976-1978
Genyonemus lineatus	48.8	49.0
Engraulis mordax	24.7	14.9
Lepidogobius lepidus	9.2	-
Seriphus politus	5.5	19.0
Symphurus atricauda	3.7	4.2
Phanerodon furcatus	2.2	2.2
Cymatogaster aggregata	2.2	-
Peprilus simillimus	-	2.8
Total	96.3	91.4

Source: COE, 1984d, p. A-1-128.

Table I.3-15 - Cabrillo Beach: Most Numerically Abundant Fish Species Collected by Otter Trawl Between February 1979 and January 1980

Species	Total Catch (%)
Genyonemus lineatus	31.1
Phanerodon furcatus	20.5
Engraulis mordax	19.2
Seriphus politus	6.2
Cymatogaster aggregata	5.2
Symphurus atricauda	5.1
Paralichthys californicus	3.0
Lepidogobius lepidus	-
Total	90.3

Source: SCOSC, 1980.

Table I.3-16 - Cabrillo Beach: 21 Most Abundant Fishes by Numbers and Biomass Taken by All Sampling Methods

Species	% of Total Numbers	% of Total Biomass
Engraulis mordax	58.7	2.5
Genyonemus lineatus	10.4	38.9
Seriphus politus	8.4	5.2
Leuresthes tenuis	3.9	0.2
Phanerodon furcatus	3.5	6.2
Micrometrus minimus	2.3	1.8
Clevelandia ios	1.6	<0.1
Symphurus atricauda	1.3	1.1
Cymatogaster aggregata	1.3	0.6
Hyperprosopon argenteum	1.2	3.3
Embiotoca jacksoni	1.1	7.6
Atherinops affinis	0.8	0.3
Atherinopsis californiensis	0.7	2.3
Paralichthys californicus	0.7	7.2
Lepidogobius lepidus	0.6	<0.1
Gibbonsia elegans	0.6	0.3
Syngnathus californiensis	0.6	0.2
Heterostichus rostratus	0.4	1.6
Sebastes dalli	0.2	0.2
Paralabrax nebulifer	0.2	2.1
Damalichthys vacca[a]	0.2	3.1

[a]Rhacochilus per American Fishery Society (1980).
Source: SCOSC, 1980.

Table I.3-17 - Cabrillo Beach: Juveniles in Samples of the 20 Most Abundant Fish Species Collected Between February 1979 and January 1980

Rank	Species	Juveniles (%)
1	Engraulis mordax	100
2	Genyonemus lineatus	29
3	Seriphus politus	75
4	Leuresthes tenuis	100
5	Phanerodon furcatus	62
6	Micrometrus minimus	35
7	Clevelandia ios	100
8	Symphurus atricauda	15
9	Cymatogaster aggregata	42
10	Hyperprosopon argenteum	62
11	Embiotoca jacksoni	17
12	Atherinops affinis	94
13	Atherinopsis californiensis	68
14	Paralichthys californicus	68
15	Lepidogobius lepidus	83
16	Gibbonsia elegans	64
17	Syngnathus californiensis	35
18	Heterostichus rostratus	18
19	Sebastes dalli	98
20	Paralabrax nebulifer	86

Source: SCOSC, 1980.

Table I.3-18 - Cabrillo Beach: Life History Stages Represented in Samples of Fish Species Collected Between February 1979 and January 1980

Species[a]	Life History Stage				Minimum Size (mm SL) for Inclusion in Adult Stage[b]
	Egg	Larval	Juvenile	Adult	
Acanthogobius flavimanus	-	-	X	X	100
Amphistichus argenteus	-	-	X	X	125
Anchoa compressa	-	-	X	-	100
Anchoa delicatissima	-	-	-	X	50
Atherinops affinis	-	X	X	X	100
Atherinopsis californiensis	-	X	X	X	200
Brachyistius frenatus	-	-	-	X	60
Cheilotrema saturnum	-	X	X	X	100
Chilara taylori	-	-	-	X	100
Citharichthys stigmaeus	-	-	-	X	50
Clevelandia ios	-	X	X	-	20
Clinocottus analis	-	X	-	-	50
Cymatogaster aggregata	-	-	X	X	60
Cynoscion nobilis[c]	-	-	X	-	500
Embiotoca jacksoni	-	-	X	X	100
Engraulis mordax	X	X	X	X	100
Genyonemus lineatus	-	X	X	X	125
Gibbonsia elegans	-	-	X	X	100
Gillichthys mirabilis	-	X	X	-	100
Girella nigricans	-	-	-	X	100
Gobiesox rhessodon	-	X	-	-	-
Hyperprosopon argenteum	-	-	X	X	100
Heterostichus rostratus	-	X	X	X	100
Hypsoblennius gentilis	-	X	-	-	-
Hypsopsetta guttulata	X	X	-	X	100
Ilypnus gilberti	-	X	X	-	20

Table I.3-18 (Contd)

Species[a]	Life History Stage				Minimum Size (mm SL) for Inclusion in Adult Stage[b]
	Egg	Larval	Juvenile	Adult	
Lepidogobius lepidus	-	-	X	X	40
Leptocottus armatus	-	X	X	X	110
Leuresthes tenuis	-	X	X	-	115
Menticirrhus undulatus	-	-	X	X	250
Micrometrus minimus	-	-	X	X	60
Mugil cephalus	-	-	X	-	200
Mustelus californicus	-	-	-	X	300
Myliobatis californica	-	-	-	X	300
Ophidion scrippsi	-	-	-	X	100
Paralabrax clathratus	-	-	X	X	175
Paralabrax maculatofasciatus	-	X	X	-	175
Paralabrax nebulifer	-	-	X	X	175
Paralichthys californicus	-	X	X	X	250
Parophrys vetulus	-	X	X	X	200
Peprilus simillimus	-	-	-	X	100
Phanerodon furcatus	-	-	X	X	100
Pleuronichthys coenosus	X	-	-	-	-
Pleuronichthys decurrens	X	-	-	-	-
Pleuronichthys ritteri	X	X	X	X	100
Pleuronichthys verticalis	X	X	X	X	100
Porichthys myriaster	-	-	X	X	200
Porichthys notatus	-	-	-	X	150
Rhacochilus toxotes	-	-	-	X	100
Rhacochilus vacca[d]	-	-	X	X	200
Sarda chiliensis	-	-	-	X	300
Scomber japonicus	-	-	-	X	275
Scorpaena guttata	-	-	X	X	100

Table I.3-18 (Contd)

Species[a]	Life History Stage				Minimum Size (mm SL) for Inclusion in Adult Stage[b]
	Egg	Larval	Juvenile	Adult	
Sebastes auriculatus	-	-	X	-	200
Sebastes dalli	-	-	X	X	100
Sebastes mystinus	-	-	X	-	100
Sebastes rastrelliger	-	-	X	-	200
Sebastes serranoides	-	-	X	X	200
Seriphus politus	-	X	X	X	100
Sphyraena argentea	-	-	X	-	500
Symphurus atricauda	-	X	X	X	100
Syngnathus californiensis	-	X	X	X	200
Syngnathus exilis	-	-	-	X	100
Syngnathus leptorhynchus	-	-	-	X	100
Synodus lucioceps	-	-	X	X	300
Trachurus symmetricus	-	-	-	X	240
Triakis semifasciata	-	-	X	X	300
Ulvicola sanctaerosae	-	X	X	-	100
Umbrina roncador	-	-	-	X	100
Xystreurys liolepis	-	-	X	X	140

[a]The following incompletely identified taxa were also collected: (1) Eggs: Citharichthys sp., Sciaenidae and Serranidae: (2) Larvae: Cottid I, Cottidae, Gibbonsia sp., Gibiesox sp., Gobiid I, Gobiid II, Gobiidae, Hypsoblennius sp., and Sebastes sp.

[b]Distinction of juvenile and adult stages based on information from the literature and/or on the condition (e.g., size class or gonadal state of captured specimens.

[c]Recently renamed Atractoscion nobilis (AFS, 1980).

[d]Also known as Damalichthys vacca.

Source: SCOSC, 1980.

Table I.3-19 - Los Angeles-Long Beach Harbors:
Marine Mammals and Sea Turtles Sighted

Common Name	Species
Common dolphin	*Delphinus delphis*
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*
Striped (longsnout)	*Stenella caeruleoalba*
(California) gray whale	*Eschrichtius robustus*
California sea lion	*Zalophus californianus*
Harbor seal	*Phoca vitulina*
Northern elephant seal	*Mirounga angustirostris*
Green (sea) turtle	*Chelonia mydas*

Common and scientific names from Burt and Grossenheider, 1976.
Source: Modified from COE, 1984d, p. A-1-175; Seagars, 1985.

Table I.4-1 - Comparison of Habitat Alteration and Net Habitat Change in POLA with Proposed Landfill Island and Alternatives 1 and 2 (acre)

Habitat	Pactex Proposal 75-ft dredge depth Dike: south & east 115-acre island Beach (10:1)	Alternative 1 70-ft dredge depth Dike: south & east 96-acre island Beach (10:1)	Alternative 2 75-ft dredge depth Dike on all sides 170-acre island No beach
Benthic side slope			
North of breakwater (protected)	+1.4	+1.2	+1.5
South of breakwater (unprotected)	+1.1	+0.9	+1.1
Landfill over deep soft bottom			
Island	-115.0	-96.0	-170.0
Beach	-68.1	-63.0	0.0
Dikes	-25.2	-23.9	-37.5
Total island footprint	-208	-183	-208
Rocky dike	+19.4	+18.1	+31.2
Beach	+46.5	+43.2	0.0
Piling	+2.8	+2.6	+2.8

+ = habitat gain
- = habitat loss
Source: POLA, 1985.

APPENDIX I.5

OIL SPILL CHARACTERISTICS

The designation of any petroleum substance as gasoline, fuel oil, or crude oil depends on the relative percentages of petroleum hydrocarbon (PHC) fractions and the nitrogen, sulfur, and oxygen (NSO) compounds it contains. Table I.5-1 illustrates this variability of components among different crudes and distillation products.

Table I.5-1 - Estimated Composition by Weight for Various Petroleum Substances (%)

Petroleum Product	Fraction			
	Paraffin	Cycloparaffin	Aromatic	NSO[a]
Heavy crude	10	45	25	20
Average crude	30	50	15	5
No. 6 fuel oil[b] (Bunker C)	15	45	25	15
No. 2 fuel oil[c]	30	45	25	0
Gasoline	50	45	10	0
Kerosene	35	50	15	0

[a]Nitrogen, sulfur, oxygen compounds.
[b]No. 6 fuel oil (Bunker C) is used for fueling ships.
[c]No. 2 fuel oil is used for home heating.
Source: BLM, 1976, p. 3-60.

Once entrained in the marine environment, the petroleum is subject to many different physical, chemical, and biological processes that modify the original composition. The processes include spreading, evaporation, dissolution, biodegradation, emulsification, oxidation, and sedimentation (Figure I.5-1). The rates of each are determined by the nature of the spilled oil and the temperature, nutrient level, light intensity, winds, currents, particulate matter, etc., that exist at the time. This constant removal and transformation process is called aging or weathering, and the final residue depends on the original starting material and on the conditions of the sea and atmosphere.

As the slick reaches the air/sea interface either from above or below the surface, petroleum begins to spread. The initial momentum generated by the spill is the original impetus behind the spreading effect. When this energy is dissipated, viscosity and surface tension forces take over. Although most pure hydrocarbons do not spread spontaneously, certain aromatic and very low

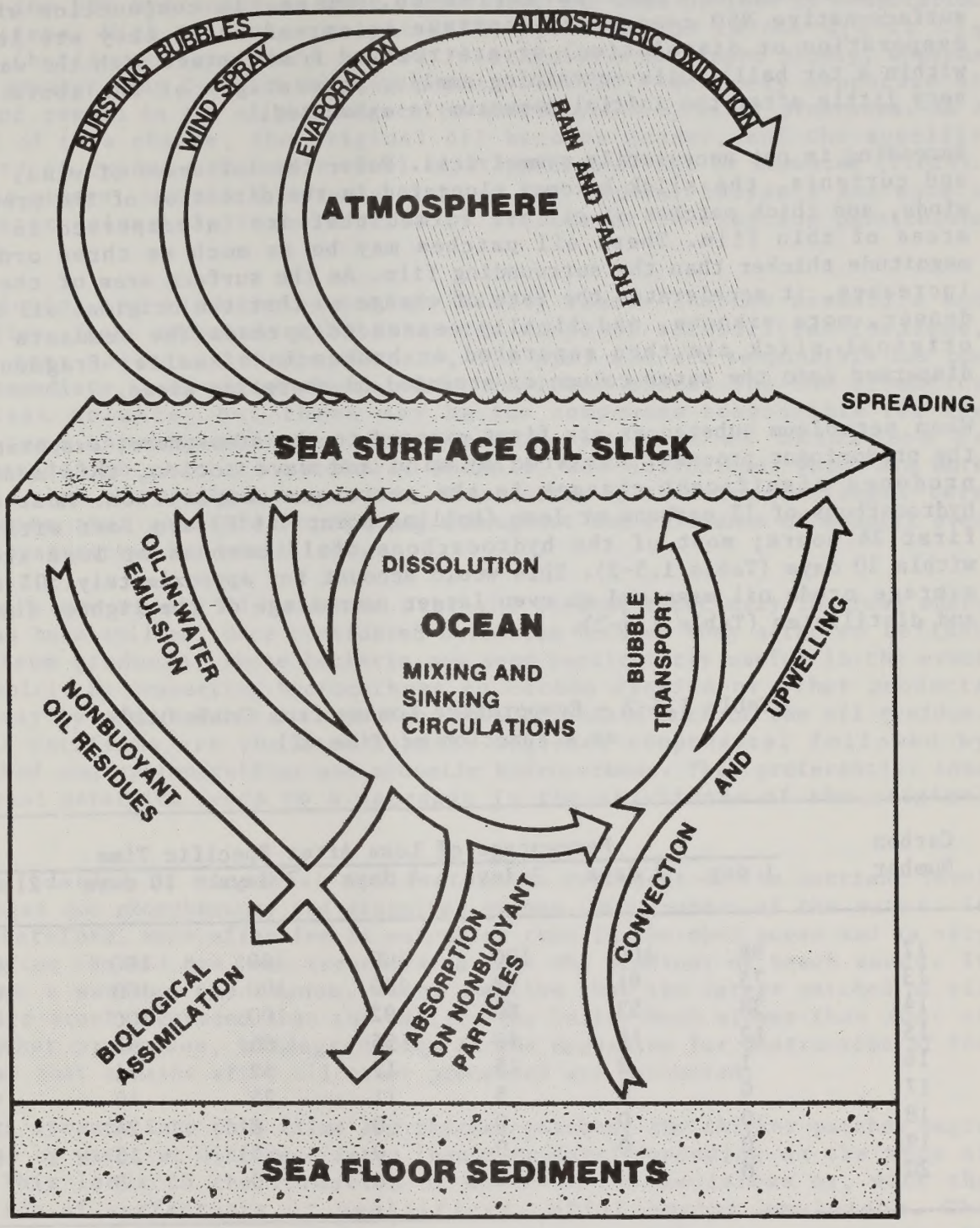


Figure I.5-1 - Natural Forces that Disperse and Modify Petroleum Slicks on Water (BLM, 1976, p. 3-63)

molecular weight (LMW) paraffins do. These, in conjunction with the surface-active NSO compounds, continue to spread until they are lost (by evaporation or dissolution) or are removed from contact with the water (as within a tar ball). Oils containing smaller percentages of the above spread very little after the initial momentum is exhausted.

Spreading is not necessarily symmetrical. Under the influence of wind, waves, and currents, the slick becomes elongated in the direction of the prevailing winds, and thick patches of oil are formed that are interspersed in larger areas of thin film. These oil patches may be as much as three orders of magnitude thicker than the surrounding film. As the surface area of the slick increases, it accelerates the rate of change so that the original oil becomes denser, more viscous, and finally ceases to spread. The remnants of the original slick are then separated or broken into smaller fragments and dispersed into the water column or stranded on shoreline areas.

When petroleum substances are first exposed to the atmosphere, evaporation is the predominant process. Assisted by wind and wave action, this mechanism produces significant changes in the petroleum composition. Most of the hydrocarbons of 12 carbons or less (boiling point 446°F) are lost within the first 24 hours; most of the hydrocarbons of 15 carbons or less are lost within 10 days (Table I.5-2). This would account for approximately 50% of the average crude oil mass and an even larger percentage of the lighter fuel oils and distillates (Table I.5-2).

Table I.5-2 - Evaporative Losses from Crude Oil[a] as a Function of Time (%)

Carbon Number	Percentage of Loss After Specific Time						
	1 day	2 days	3 days	4 days	7 days	10 days	21 days
12	98	100	100	100	100	100	100
13	75	91	98	100	100	100	100
14	38	52	80	92	100	100	100
15	12	18	40	55	84	95	100
16	1	2	15	17	52	74	88
17	0	0	5	11	25	40	58
18	0	0	0	0	8	24	35
19	0	0	0	0	5	13	13
20	0	0	0	0	0	3	3

[a]Film thickness of 0.5 mm.
Source: BLM, 1976, p. 3-67.

After the LMW hydrocarbons have evaporated, the rate of loss by evaporation stabilizes. High molecular weight (HMW) hydrocarbons in the C_{15} to C_{25} range (boiling points 446°F to 752°F) evaporate much more slowly, whereas those greater than C_{25} with boiling points of >752°F scarcely evaporate at all and remain in the slick, subject to modification by other processes. As a result of this change, the original oil becomes denser, and the specific gravity of crudes and heavier fuel oils approaches that of seawater (1.025). If this occurs, the oil achieves a state of near-neutral buoyancy and enters the water column via turbulence or by attachment to existing particulate matter.

Dissolution and evaporation preferentially remove the LMW aromatics and paraffins. These compounds exhibit a wide range of solubilities (benzene, 1,780 ppm; toluene, 515 ppm; hexane, 9.5 ppm) and are responsible for the more immediate toxic effects suffered by the local biota. The HMW aromatics are less soluble, but these may be the compounds responsible for the long-term chronic effects. Other processes such as oxidation or biodegradation generate alcohols, phenols, and sulfoxides, which are more soluble than the original components. Dissolution is therefore a longer term mechanism that continues operating throughout the existence of a spill even after evaporation has stabilized.

Bacteria are widely distributed over the oceans, especially in areas where oil has been spilled. Once considered nuisances because they attacked refined petroleum products, these bacteria now seem particularly useful in the event of a spill. By converting hydrocarbons to carbon dioxide or other products that may be more soluble in seawater, they eliminate much of the oil residue. Normal paraffins are the most readily degraded components, followed by branched and cycloparaffins and aromatic hydrocarbons. This preferential loss of normal paraffins leads to a decrease in the stickiness of the original oil.

Biodegradation or microbial utilization is dependent on the nutrient level (nitrogen and phosphorous) and dissolved oxygen (DO) content of the water. It is, therefore, more effective in estuaries than in the open ocean and is very slow after the oil has been incorporated into the seafloor or beach sands. It is also a surface phenomenon, which implies that the larger patches of oil are more slowly degraded than the smaller tar balls. Much slower than most of the other processes, biodegradation is the mechanism for destruction of the residue that remains after all other processes are exhausted.

As oil spreads into thin films and thicker patches, the thicker patches begin to take up water at different rates (hours or days) depending on the type of oil. This leads to the formation of water-in-oil emulsions or, with the addition of surfactants or emulsifiers, oil-in-water emulsions. The water-in-oil emulsion, which can contain up to 80% water, produces the "chocolate mousse" formations that have been found after some spills.

By increasing the actual volume of the spilled oil, this type of emulsification can increase the rate of the processes of evaporation, dissolution, and biodegradation, and the density of the remaining oil would therefore increase. Under the influence of turbulence, the larger patches of oil thus formed are broken up and can produce tar balls.

Auto-oxidation and photo-oxidation are two other processes that generate more soluble products from the original components. They can be catalyzed or inhibited by trace metals or other components of the oil; e.g., vanadium catalyzes oxidation while sulfur stops it by forming sulfoxide. By photolysis alone, the estimated time for decomposition of a 2.5 um slick (approximately 1,700 gallons) is 100 hours.

The remaining process is sedimentation. As the LMW PHC fractions evaporate and dissolve and the HMW fractions are degraded, the oil residue becomes denser. When its specific gravity approaches that of seawater, it may be more easily sunk either by agglomeration onto existing particulate matter or by wave action, which carries the near-neutral buoyancy residue deeper into the water column or forces it into the bottom sediments. Waves and currents may also carry the residue onto beaches or shoreline structures where it is either incorporated into the sand or chronically resuspended. Once oil is incorporated in sediments or sands, the rates of change are much slower. Buried several centimeters beneath the surface sediments, the oil changes very little via evaporation, dissolution, oxidation, or emulsification. Biodegradation, the remaining process, is slowed by a lack of nutrients and DO, and the time for degradation lengthens from days and months to years. Large quantities of oil that inundate a beach or that are sunk in a specific area can cause erosion and thereby enlarge the affected area by carrying oil farther from the original site.

An oil spill that occurs on the open ocean would cause much less damage than one that occurs nearshore because the more immediately toxic components would evaporate or dissolve to form very dilute solutions. If a spill occurs in Los Angeles-Long Beach Harbor, oil that reaches the shore or harbor habitats would not have had time to weather, and a greater amount of both immediate and long-term damage would result.

The spread of an oil slick on the undisturbed sea surface is a result of gravitational, inertial, viscous, and surficial factors. Initially, spills would spread because of a balance of gravitational and inertial forces. As the thickness of the slick decreases, viscous forces retard spreading. Finally, for the thinnest slick, surface tension becomes important and the rate of spreading increases until a maximum size is attained. For spills of 100,000 barrels, the inertial phase lasts 1 hour; for spills of 100 barrels the inertial phase is much less than 1 hour, while the viscous phase lasts about 1 hour; for spills of 10 barrels or less, neither inertial nor viscous phases last very long, and surface tension brings the slick to maximum size in a few hours. Figure I.5-2 is a graph of the radius of a slick as a function of time for various sizes of spills. The time axis begins at 1 hour. Therefore, the inertial phase is not shown because volume spilled influences the radius, and separate curves are required. As the final stages of spreading are reached, the radius increases independently of the volume. The maximum size of a slick depends on the original volume. If the slick loses its filmlike characteristics by forming emulsions or globules, the model upon which Figure I.5-2 is based no longer applies. Discrete floating blobs of residue would disperse over wider and wider areas of the sea surface as a result of dispersive forces.

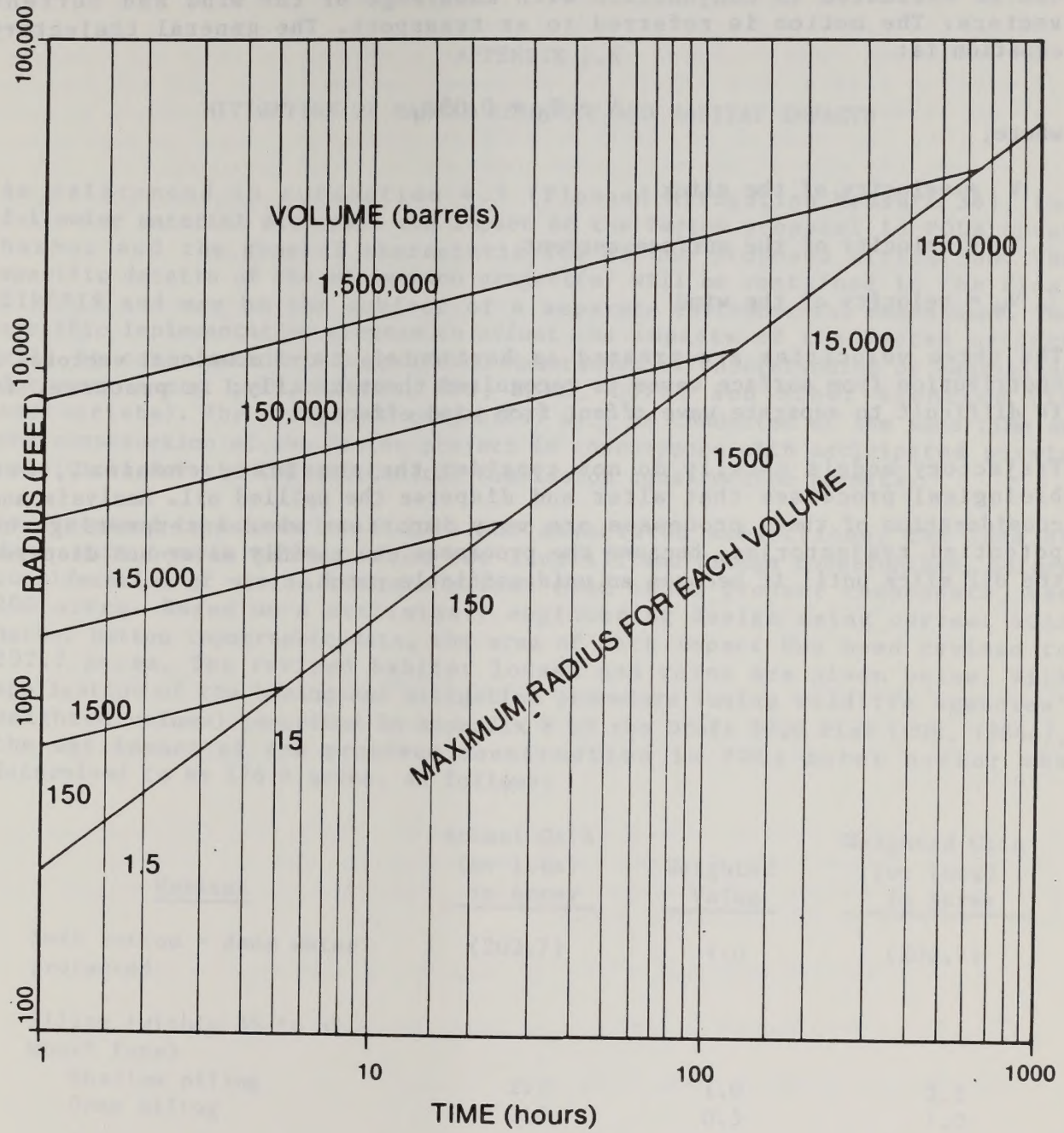


Figure I.5-2 - Radii of Oil Slicks as a Function of Time and Volume Spilled (BLM, 1976, p. 3-68)

The translation of the center of a hypothetical slick across the sea surface can be estimated in conjunction with knowledge of the wind and current vectors. The motion is referred to as transport. The general trajectory equation is:

$$V = V_c + 0.03V_w$$

where,

V = velocity of the slick

V_c = velocity of the surface current

V_w = velocity of the wind

The three velocities are treated as horizontal, two-dimensional vectors. A contribution from surface waves is recognized theoretically; in practice, it is difficult to separate wave effect from wind effect.

Trajectory models usually do not consider the physical, chemical, and biological processes that alter and disperse the spilled oil. Analysis and consideration of these processes are very important when interpreting the potential trajectories, because the processes can rapidly alter and disperse the oil slick until it becomes an unidentifiable patch.

APPENDIX I.6

MITIGATION OF MARINE RESOURCE AND HABITAT IMPACTS

As referenced in subsection 4.7 (Planned Mitigation Measure 36), the following material discusses the impact of the Pactex proposal in POLA outer harbor and the general characteristics of the proposed mitigation. The specific details of the mitigation project(s) will be contained in the Final EIR/EIS and may be the subject of a separate environmental assessment. The specific implementation program to offset the impacts of the Pactex project will be contained in a negotiated Memorandum of Understanding or equivalent document among LAHD, Pactex, FWS, NMFS, CDFG, and other agencies (if appropriate). The mitigation project(s) will be conducted at the same time as the construction of the Pactex project in concurrence with anticipated permit conditions for the COE and Coastal Commission construction permits.

As discussed in subsection 4.2.15 and associated subsections, the loss of deep soft bottom habitat from the landfill and dredge construction, before consideration of marine habitats gained from other project components, was 208 acres. Based on a preliminary engineering design using current NOAA harbor bottom topographic data, the area of such impact has been revised to 202.7 acres. The revised habitat losses and gains are given below. With application of the biological mitigation procedure (using wildlife agencies' weighted values) described in Appendix F of the Draft 2020 Plan (COE, 1984d), the net impact of the proposed construction in POLA outer harbor was determined to be 176.4 acres, as follows:

Habitat	Actual Gain (or loss) in Acres	Weighted Value	Weighted Gain (or loss) in Acres
Soft bottom - deep water protected	(202.7)	1.0	(202.7)
Piling (within 35 ft of wharf face)			
Shallow piling	2.2	1.0	2.2
Deep piling	2.0	0.5	1.0
Benthic side slope			
Deep water protected	1.4	1.0	1.4
Deep water unprotected	1.1	0.5	0.6
Rocky habitat (exposed)			
Deep water protected	9.0	1.0	9.0
Shallow water protected	8.1	1.5	12.1
Total	(178.9)		(176.4)

The general purpose of the mitigation project will be to establish unrestricted tidal influence to coastal area(s) presently having little or no marine fisheries and coastal seabird habitat value, thereby creating an area that maximizes those resource values. It is anticipated that the proposed mitigation site(s) has little or no present habitat value, and the restored habitat value on completion of the mitigation project will have a greater value than the value of the impacted habitat. Therefore, based on preliminary estimates, the area of the mitigation project will be approximately 120 to 150 acres. If, as a result of the mitigation project, excess habitat is restored, its value may be used to offset future fill projects in San Pedro Bay.

To accomplish the stated purpose of maximizing marine fisheries and coastal seabird habitats by restoring unrestricted tidal influence to low habitat value areas, a project will be designed and constructed that will meet the following criteria:

(1) Not less than 50% of the area having an average elevation of -3 ft MLLW.

(2) Not more than 35% of the area having elevations between -3 ft and +2.5 ft MLLW.

(3) Not more than 15% of the area having elevations between +2.5 ft and +5.5 ft MLLW.

Excavated material from a mitigation project site will be placed on site on an adjacent beach, or it will be transported to a suitable disposal site. The amount of material to be excavated will depend on the topography of the site chosen.

In consultation with the staff of the FWS, NMFS, and CDFG, potential mitigation project sites between Point Conception and the U.S.-Mexican border have been examined. The potential sites to mitigate the Pactex project have been narrowed to the following areas:

(1) Los Cerritos wetlands - City of Long Beach, Los Angeles County.

(2) Batiquitos Lagoon - City of Carlsbad, San Diego County.

(3) Tijuana River estuary - San Diego County.

APPENDIX J

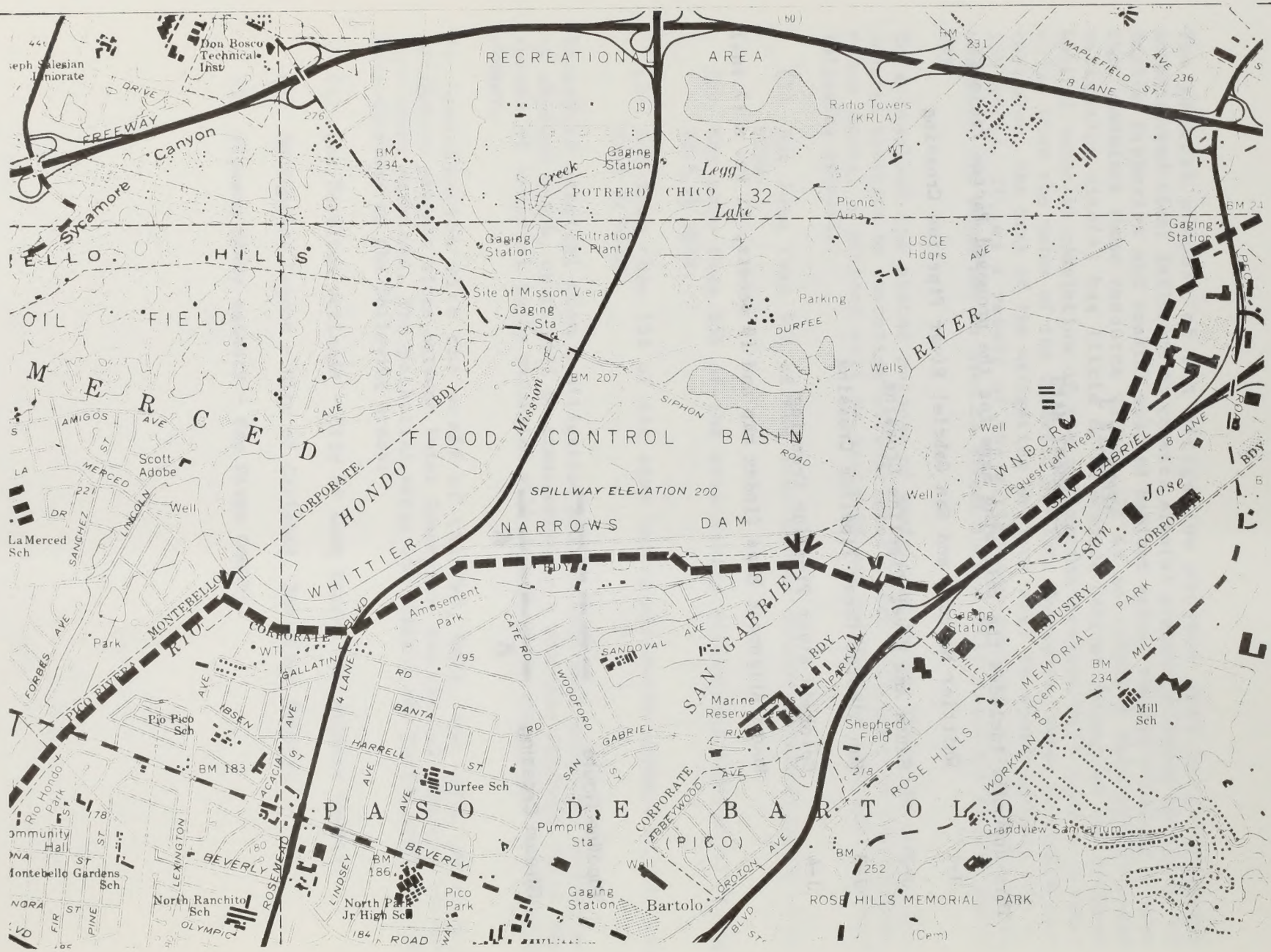
ALIGNMENT MAPS

This appendix includes the following maps for the proposed Pactex Project:

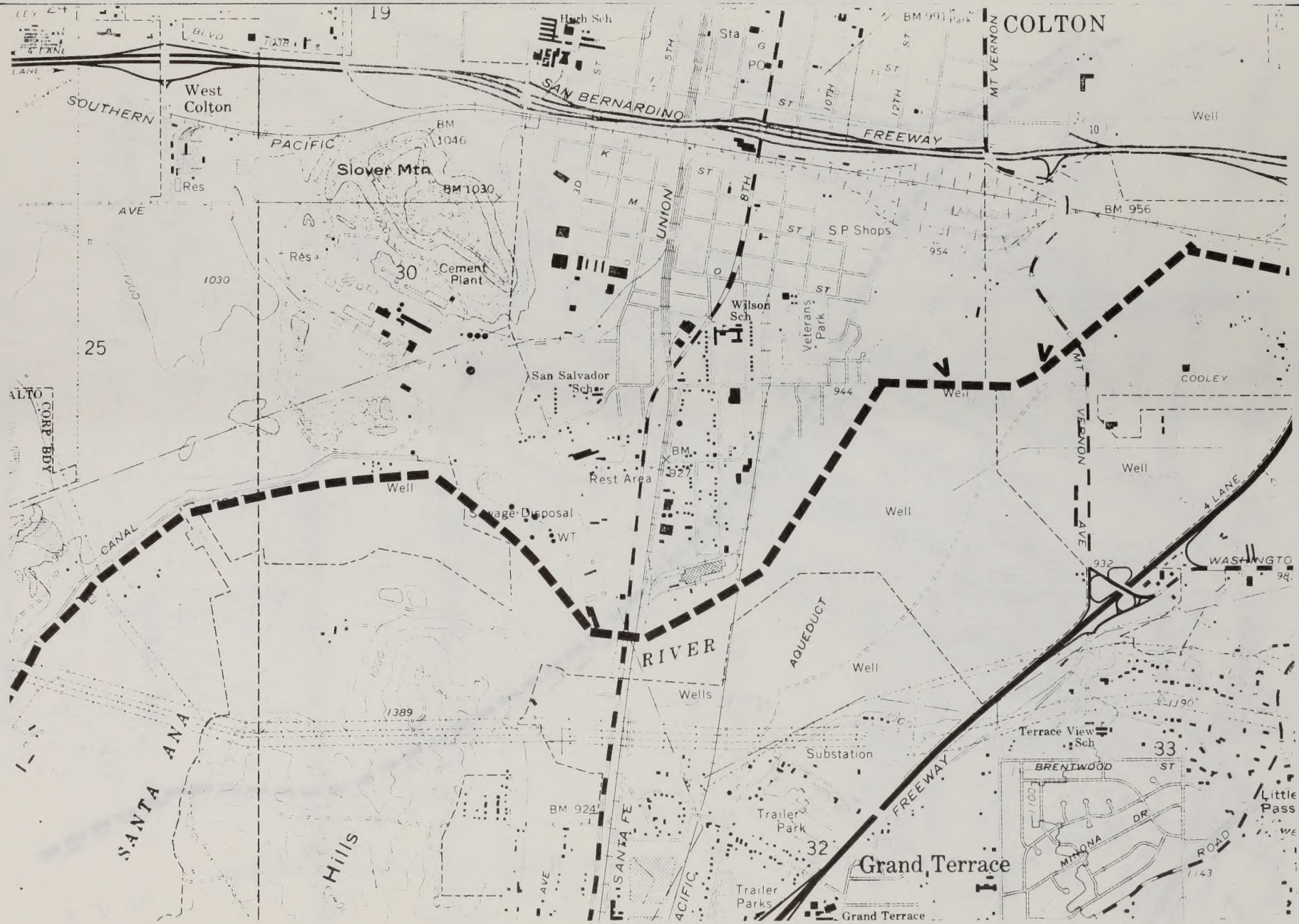
J-1	Whittier Narrows and San Gabriel River Pipeline Crossing
J-2	Santa Ana River Pipeline Crossing
J-3	San Timoteo Creek Pipeline Crossing
J-4	Colorado River Pipeline Crossing
	Route Alignment Maps (index map and 19 sheets, 11 in. x 17 in.)

Pipeline Route — — — — — —

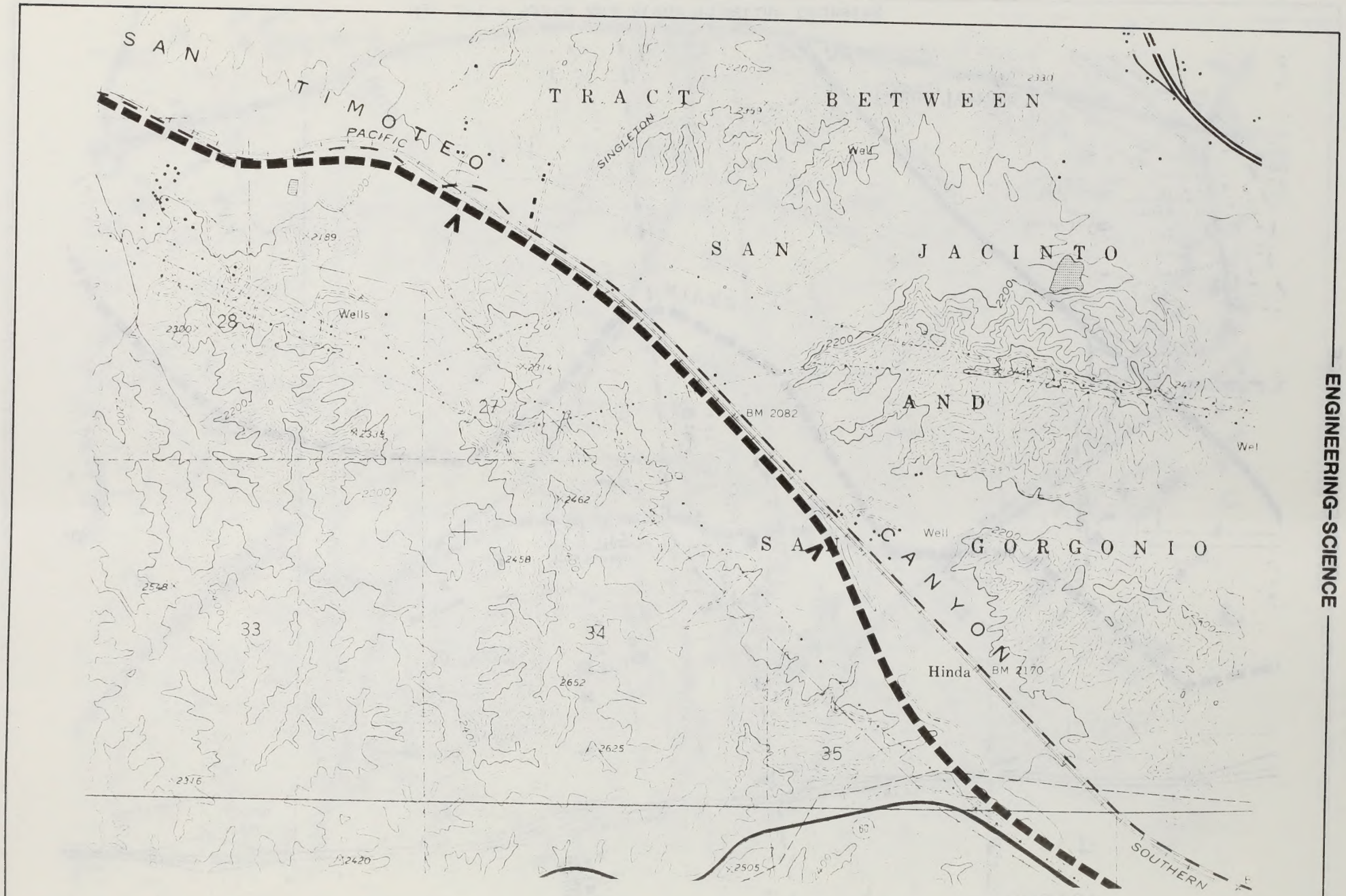
Stream Crossing — — — — — —
∧ ∧



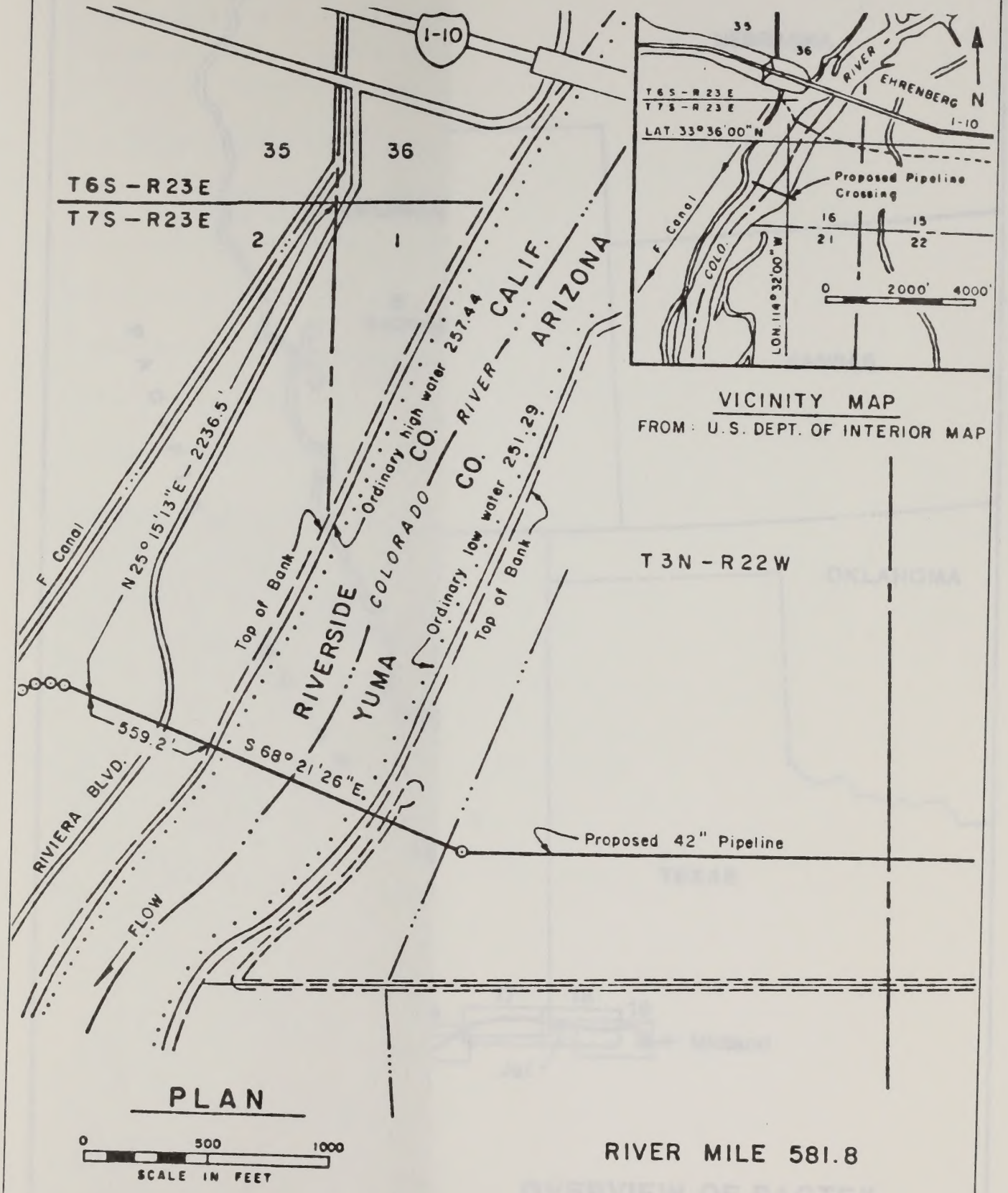
Map J-1 - Whittier Narrrows and San Gabriel River Pipeline Crossing



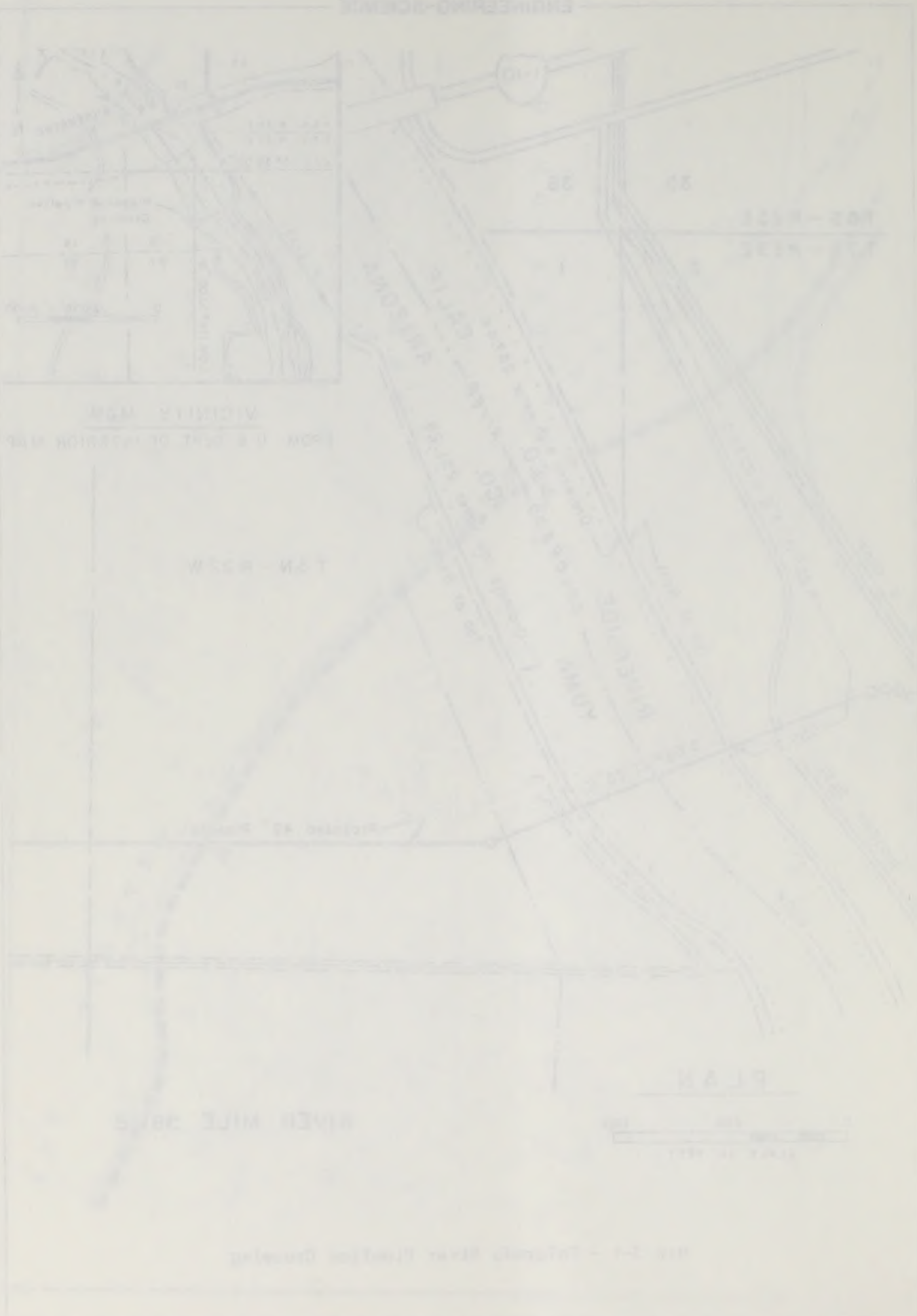
Map J-2 - Santa Ana River Pipeline Crossing

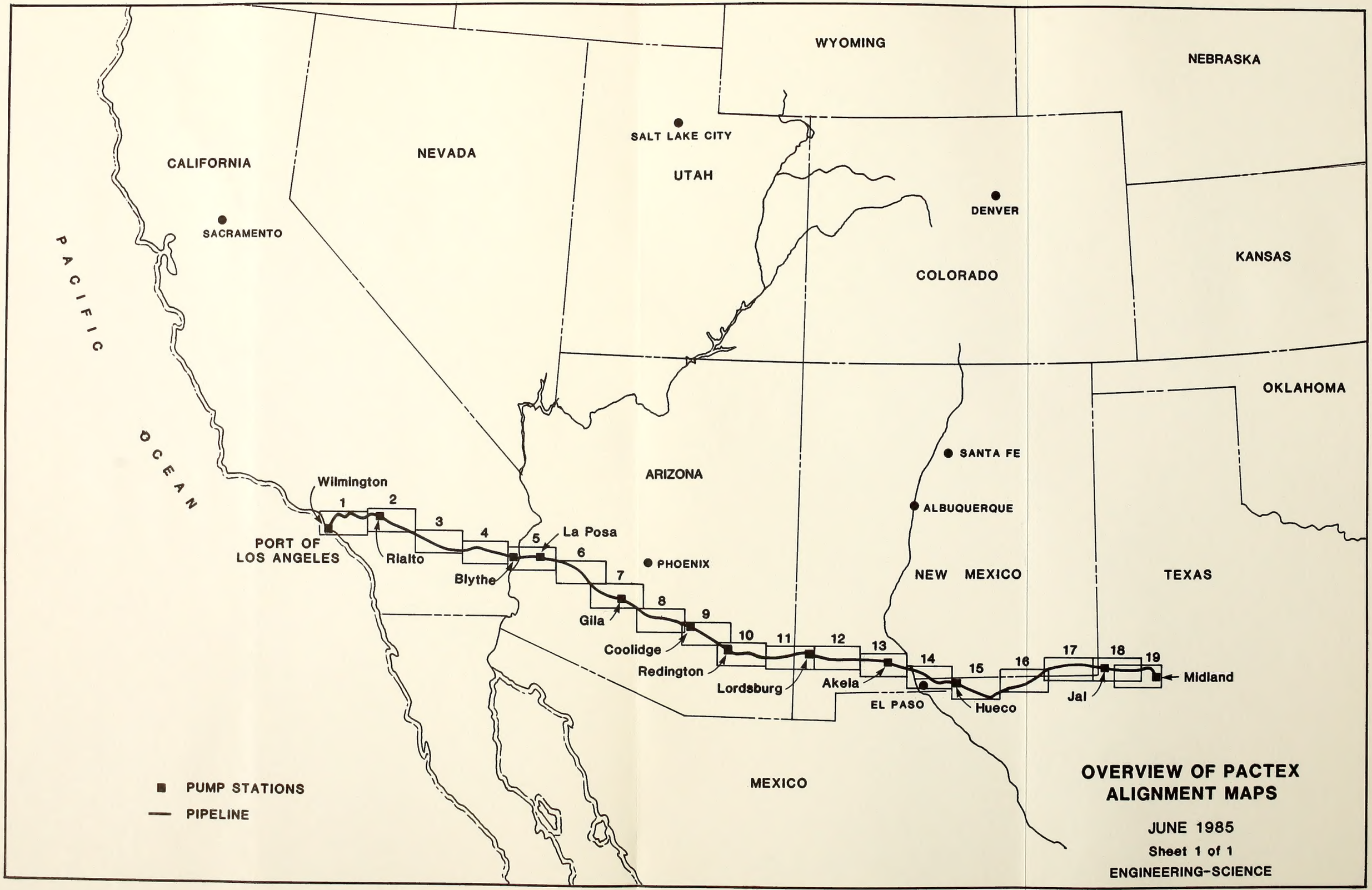


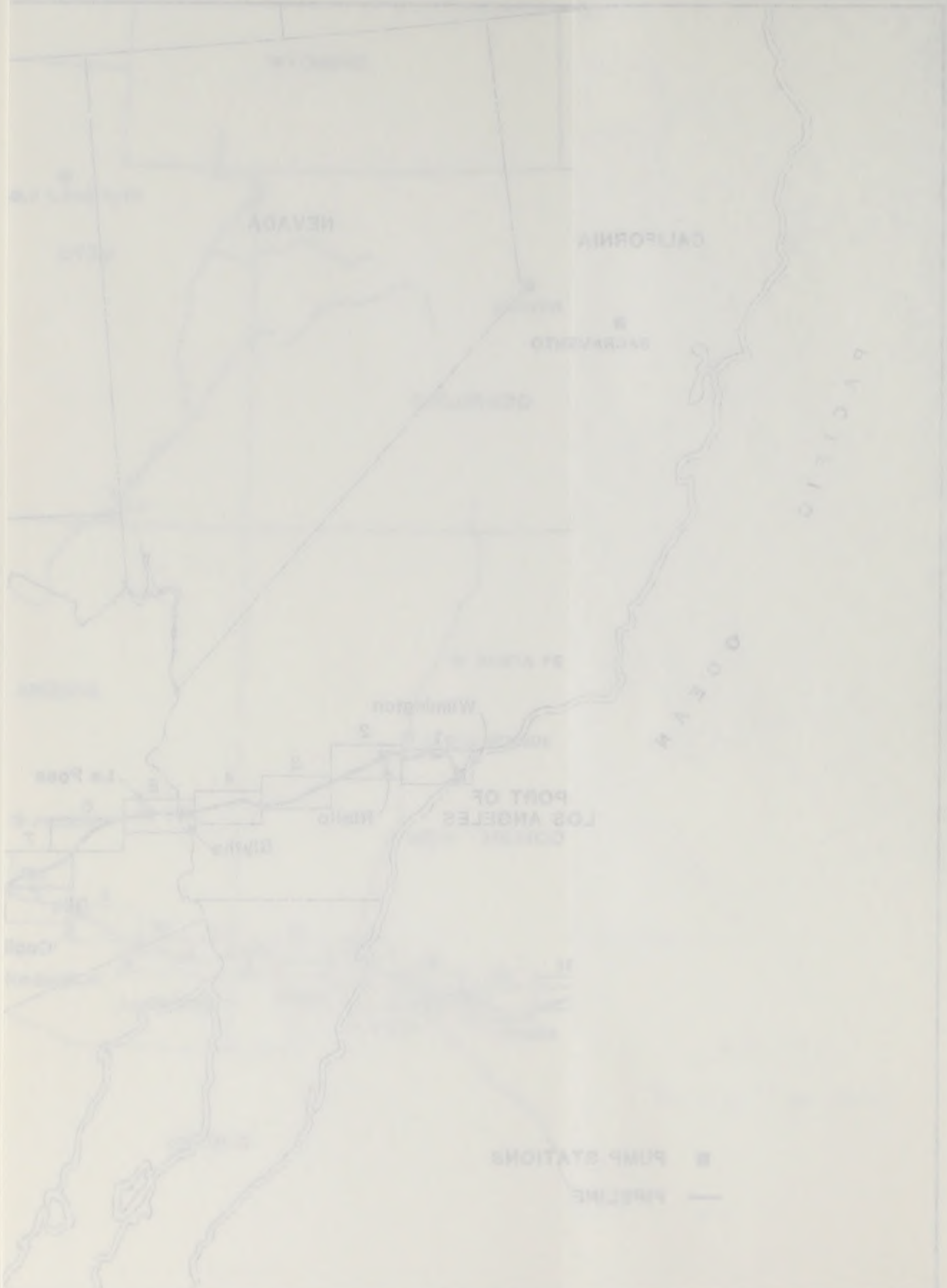
Map J-3 - San Timoteo Creek Pipeline Crossing



Map J-4 - Colorado River Pipeline Crossing




WYOMING
NEBRASKA
SALT LAKE CITY
NEVADA
CALIFORNIA
UTAH
DENVER
SACRAMENTO
KANSAS
COLORADO
PACIFIC
OCEAN
OKLAHOMA
SANTA FE
ARIZONA
ALBUQUERQUE
Wilmington
1
2
3
4
5
La Posa
6
7
8
9
10
11
12
13
14
15
16
17
18
19
PORT OF
LOS ANGELES
Rialto
Blythe
PHOENIX
NEW MEXICO
TEXAS
Gila
Coolidge
Redington
Lordsburg
Akela
Midland
Jal
Hueco
EL PASO
MEXICO
PUMP STATIONS
PIPELINE
OVERVIEW OF PACTEX
ALIGNMENT MAPS
JUNE 1985
Sheet 1 of 1
ENGINEERING-SCIENCE



CHECK VALVE — CV

BLOCK VALVE — BV

CV BV BV CV BV CV BV BV BV BV CV BV BV BV

RESIDENCES, SCHOOLS, PARKS, SEMINARY DEVELOPED	SCHOOL OPEN / INSTITUTE DEVELOPED
GW-1 LOS ANGELES BASIN; LOS ANGELES RIVER; RIO HONDO RIVER; WHITTIER NARROWS DAM; SAN JOSE CREEK	GW-2 UPPER SANTA ANA BASIN SAN ANTONIO CREEK; CUCAMONGA CREEK
PALOS VERDE FAULT ZONE — TSUNAMI & SUBAQUEOUS LANDSLIDE POTENTIAL; G1 LIQUIFACTION POTENTIAL; WHITTIER FAULT ZONE; G2 PUENTE HILLS LANDSLIDE POTENTIAL	G3 CHINO FAULT
S1 PUENTE HILLS; S2 EXPANSIVE SOILS	
RIPARIAN VEGETATION WHITTIER NAR.; CHAPARRAL, COASTAL SAGE OAK WOODLAND	
POLA-SENSITIVE WILDLIFE SPECIES — CALIFORNIA LEAST TERN AND BROWN PELICAN; RIPARIAN HABITAT	
L; F; L; F; P; L; P	

PROJECT AND PIPELINE DETAILS

LAND USE

HYDROLOGY

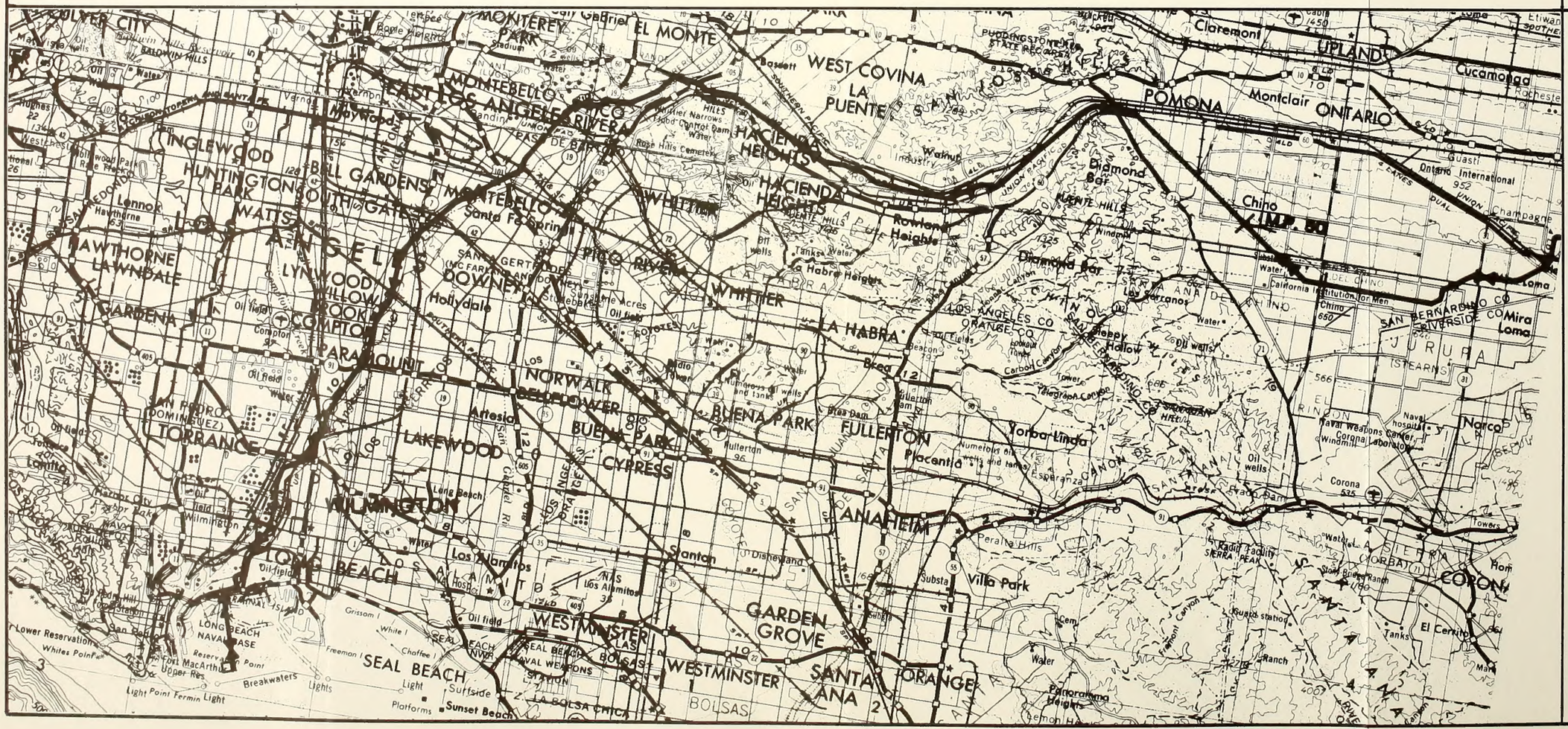
GEOLOGY

SOILS

VEGETATION

WILDLIFE

LAND OWNERSHIP



JUNE 1985

Scale: 1:250,000

MAP 1 OF 19

F – Federal Land Managed by BLM

I – Indian Land

NF – National Forest Service

DOD – Dept. of Defense

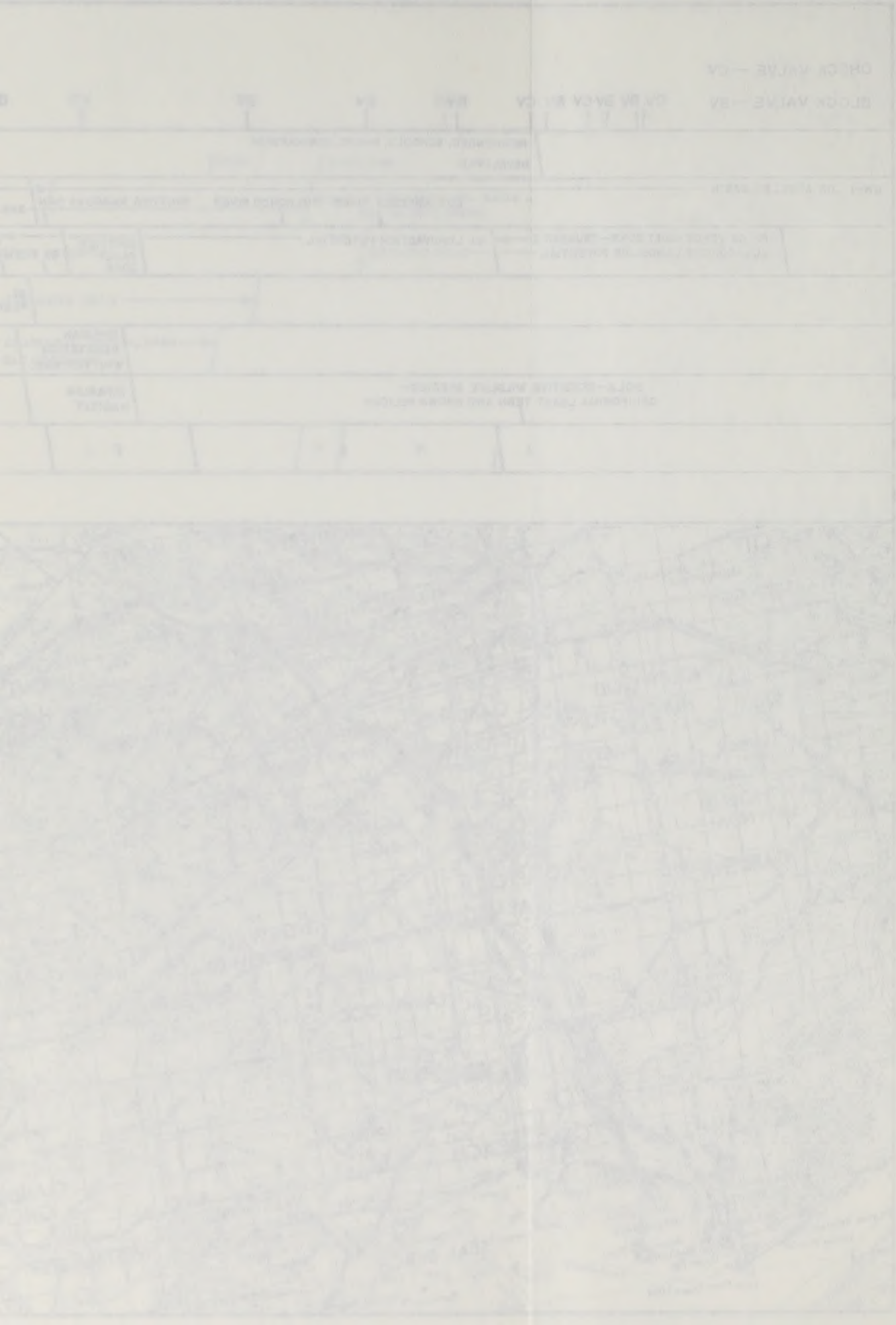
L – Local (State, County)

P – Private

PACTEX EIR/EIS

PIPELINE ALIGNMENT

ENGINEERING-SCIENCE



CV BV BV BV

RESIDENCES (CONT.) → / AGRICULTURE → OPEN → DEVELOPED	SCHOOL, HOSPITAL / AGRICULTURE → OPEN → AGRIC. → RESIDENCE SCHOOL PARK → OPEN → AGRIC. → OPEN →
GW-2 (CONT.) → SANTA ANA RIVER → SAN TIMOTEO CREEK →	SAN GORGONIO RIVER — COLORADO RIVER CANAL — WHITEWATER RIVER
G5 LIQUIFACTION → G5 SAN JACINTO FAULT	SAN TIMOTEO CANYON → SAN ANDREAS FAULT ZONE →
S3 FLOODING/EROSION	S4 FLOODING/EROSION → S5 → S5 WATER EROSION →
SANTA ANA RIVER RIPARIAN VEGETATION	SAN TIMETEO CANYON-RIPARIAN VEGETATION, GRASSLAND, COASTAL SAGE, CHAPARRAL; RARE PLANT-NEVINS BARBERRY — TRANSITION (DESERT-COASTAL) RARE PLANT-LITTLE SAN BERNARDINO MTN. LINANTHUS — (SEE NEXT MAP)
RIPARIAN HABITAT LEAST BELL'S VIREO YELLOW-BILLED CUCKOO	RIPARIAN HABITAT-LEAST BELL'S VIREO BADLANDS-POTENTIAL STEPHEN'S KANGAROO RAT — (SEE NEXT MAP)
SAN TIMETEO CANYON P	I P I P I P I P

PROJECT AND PIPELINE DETAILS

LAND USE

HYDROLOGY

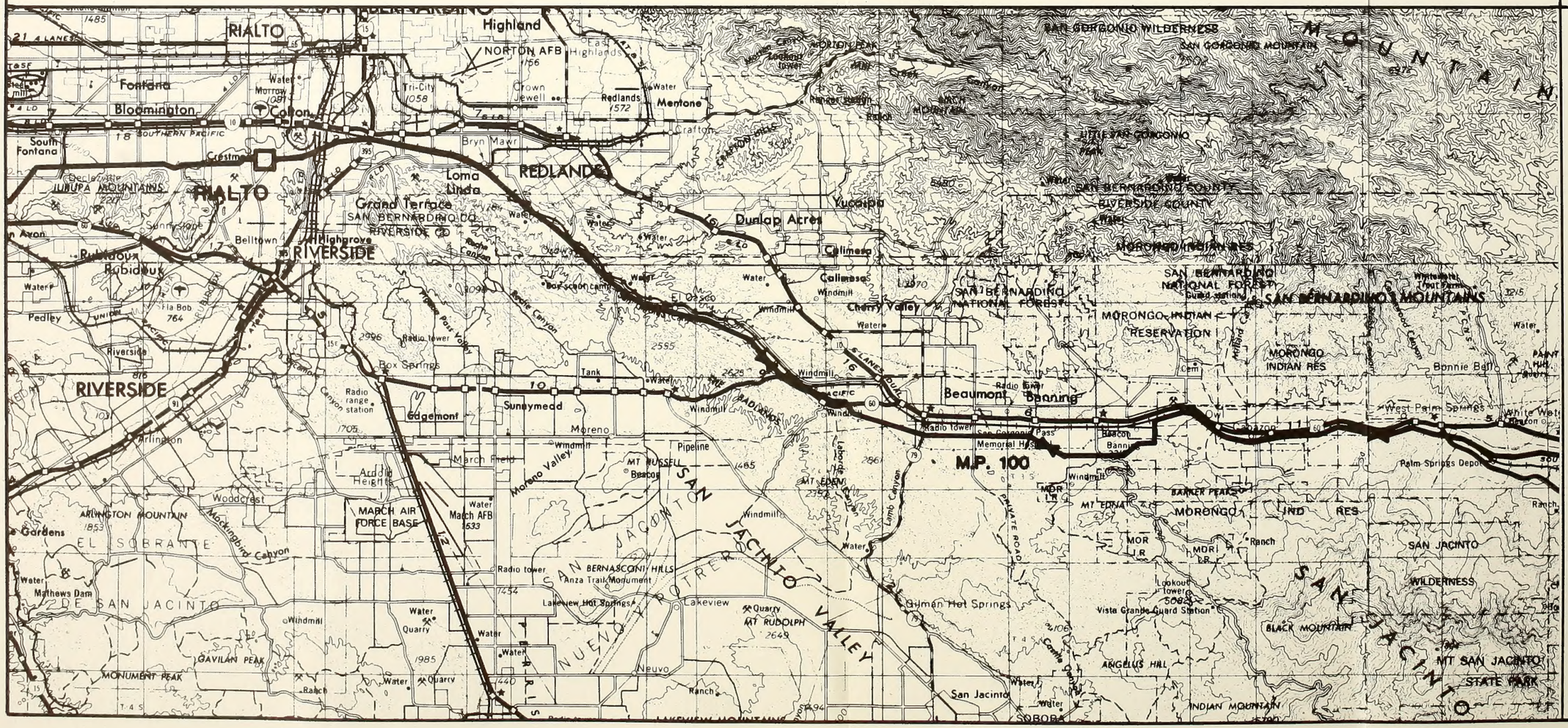
GEOLOGY

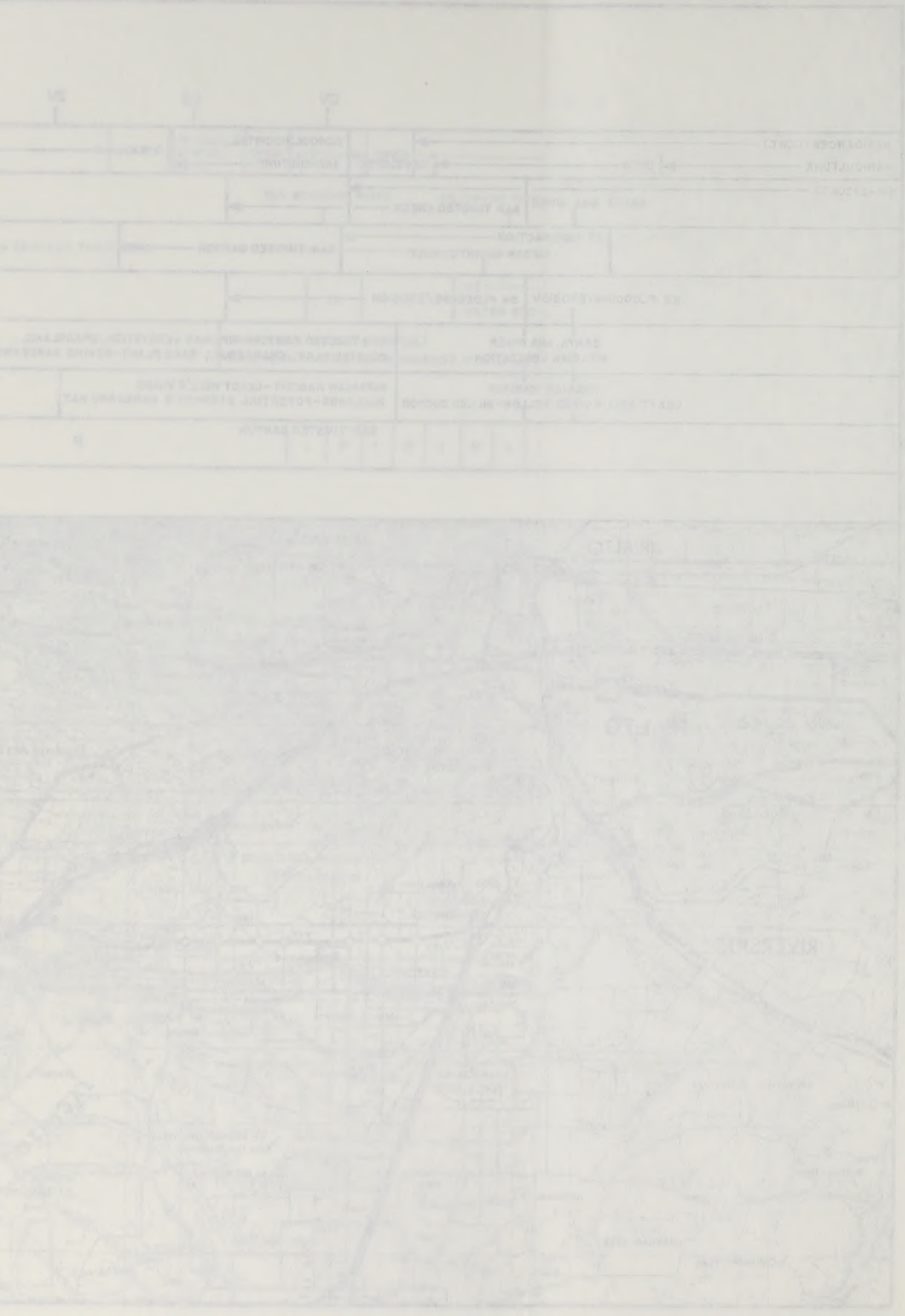
SOILS

VEGETATION

WILDLIFE

LAND OWNERSHIP

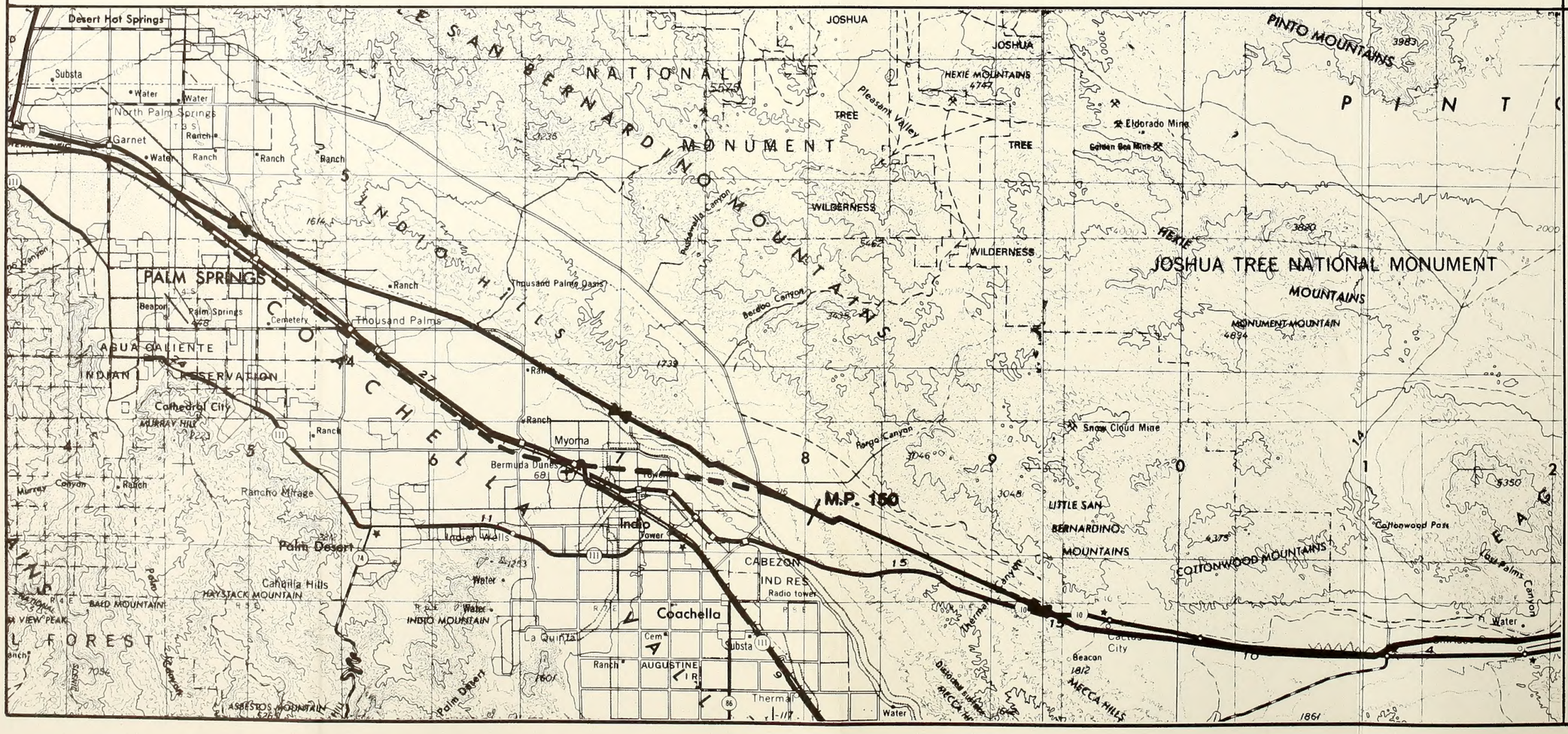

RIALTO
Highland
NORTON AFB
Fontana
Bloomington
Colton
Redlands
Mentone
REDLANDS
Loma Linda
Grand Terrace
SAN BERNARDINO CO.
RIVERSIDE CO.
RIVERSIDE
Yucaipa
Dunlap Acres
Calimesa
Cherry Valley
SAN BERNARDINO NATIONAL FOREST
SAN BERNARDINO MOUNTAINS
MORONGO INDIAN RESERVATION
Beaumont
Banning
M.P. 100
SAN GORGONIO WILDERNESS
SAN GORGONIO MOUNTAIN
MOUNTAIN
Sunnymead
Moreno
Edgemont
March Field
MARCH AIR FORCE BASE
Woodcrest
Gardens
EL SOBRANTE
DE SAN JACINTO
SAN JACINTO VALLEY
SAN JACINTO MOUNTAINS
SAN JACINTO WILDERNESS
SAN JACINTO STATE PARK
MT SAN JACINTO
Gilman Hot Springs
San Jacinto
Lakeview
Nuevo
Palm Springs
West Palm Springs
Bonnie Bell
Whitewater
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
MORONGO INDIAN RES
BARKER PEAK
MT EDNA
MT RUSSELL
MT EDEN
MT RUDOLPH
ANGELUS HILL
INDIAN MOUNTAIN
BLACK MOUNTAIN
SAN BERNARDINO NATIONAL FOREST
Box Springs
Arlington
Riverside
Pedley
Rubidoux
Jurupa Mountains
Arlington Mountain
Gavilan Peak
Monument Peak
Mt Jacinto
Lookout Tower
Vista Grande Guard Station
Palm Springs Depot
Memorial Hall
Radio tower
Windmill
Water
Quarry
Ranch
Tank
Pipeline
Beacon
Crafton
Redlands 1572
Tri-City 1058
Crown Jewell
Morrow 1081
March AFB 1533
Lakeview Hot Springs
Anza Trail Monument
Box Canyon camp
Sycamore Canyon
Mockingbird Canyon
Lamb Canyon
Reche Canyon
Wilson Creek
Cajon Creek
Morton Peak
Ranger Station
Lookout Tower
Guard Station
Cem
Airport
Golf Course
Pacific
Southern Pacific
Santa Fe
Crestmore
Fla Bob 764
Matthews Dam
Water
Windmill
Quarry
Ranch
Tank
Pipeline
Beacon
Radio tower
Radio range



COACHELLA VALLEY ALTERNATE

BV BV BV

OPEN	LAND USE
GW-3 COACHELLA VALLEY GROUNDWATER BASIN (CONT.)	HYDROLOGY
SAN ANDREAS FAULT ZONE (CONT.) — G6 SAN ANDREAS FAULT CROSSING	GEOLOGY
WATER EROSION (CONT.) → WIND EROSION → WATER EROSION →	SOILS
CREOSOTE BUSH SCRUB (CALIFORNIA SONORAN DESERT) — RARE PLANTS – COACHELLA VALLEY MILKVETCH, FLAT-SEEDED SPURGE — PALM OASIS — CACTUS SCRUB → — CALIFORNIA DITAXIS — WASHES	VEGETATION
COACHELLA VALLEY FRINGE-TOED LIZARD — FLAT-TAILED HORNED LIZARD — SENSITIVE SPECIES – DESERT TORTOISE AND BIGHORN SHEEP	WILDLIFE
P F P F I P I P L P F P F P F P F P F P F P F P L F P F P F P F P F P F P F P F P F P	LAND OWNERSHIP



PROJECT AND PIPELINE DETAILS

JUNE 1985

Scale: 1:250,000

MAP 3 OF 19

F – Federal Land Managed by BLM

I – Indian Land

NF – National Forest Service

DOD – Dept. of Defense

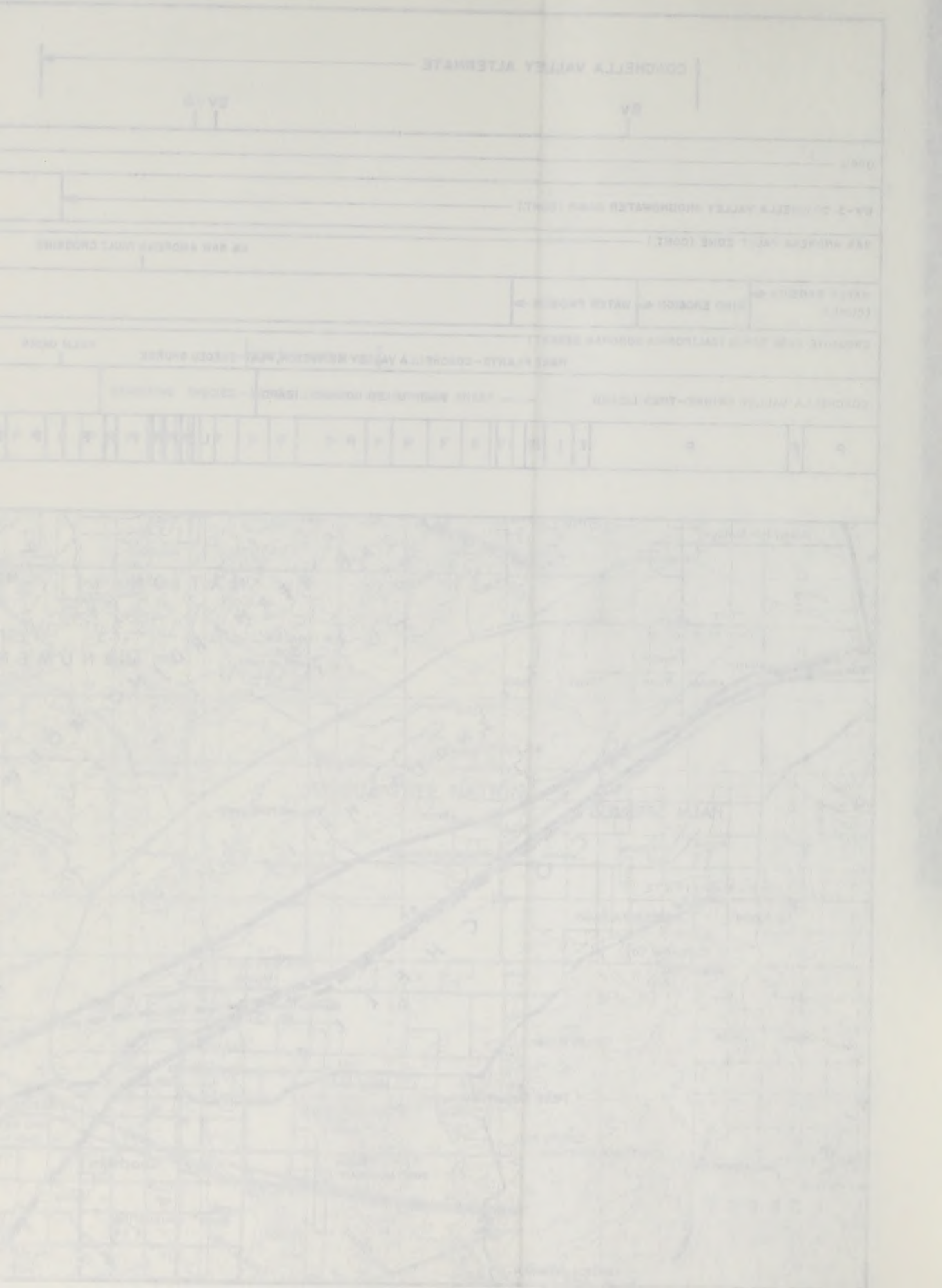
L – Local (State, County)

P – Private

PACTEX EIR/EIS

PIPELINE ALIGNMENT

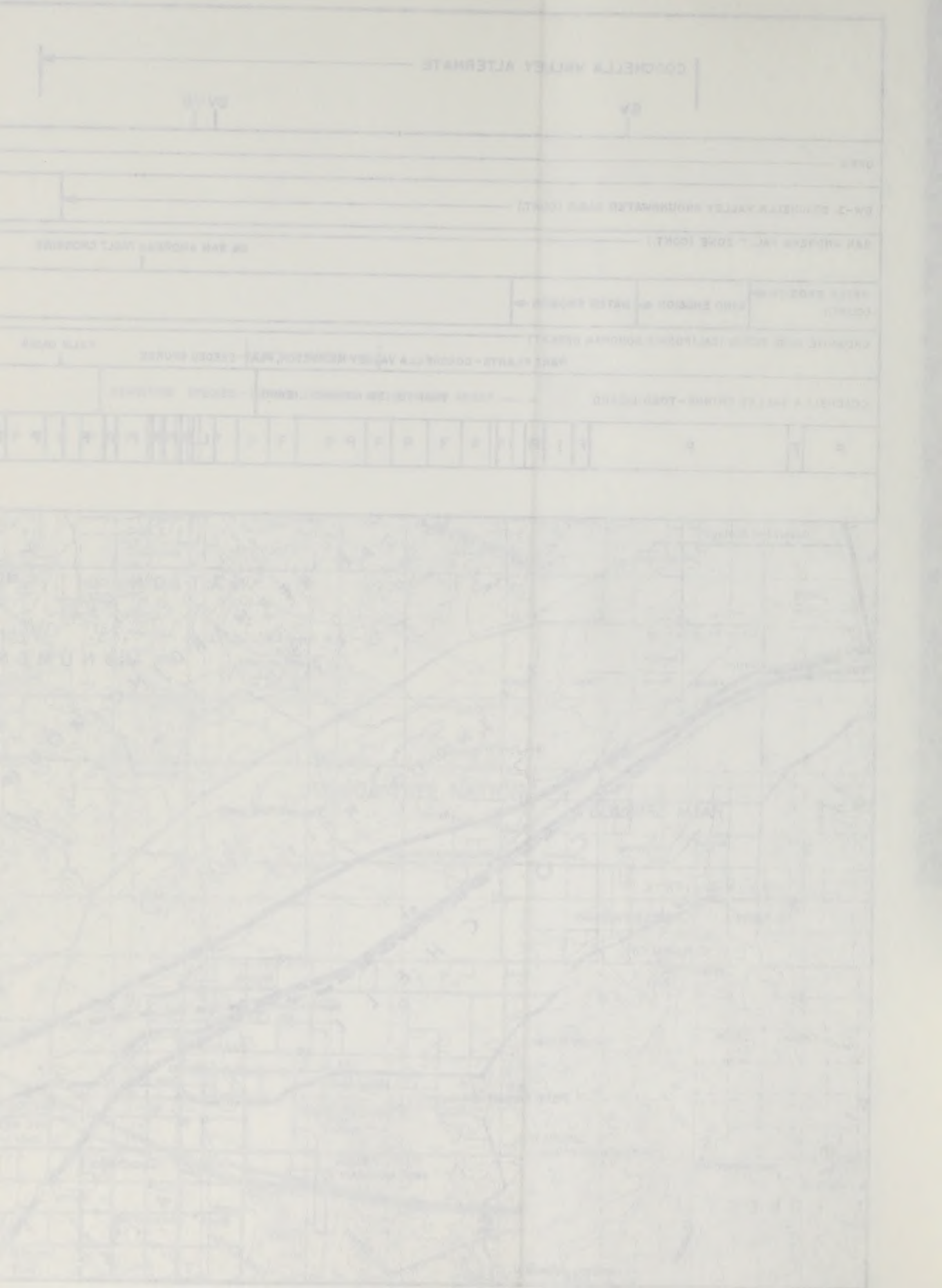
ENGINEERING-SCIENCE



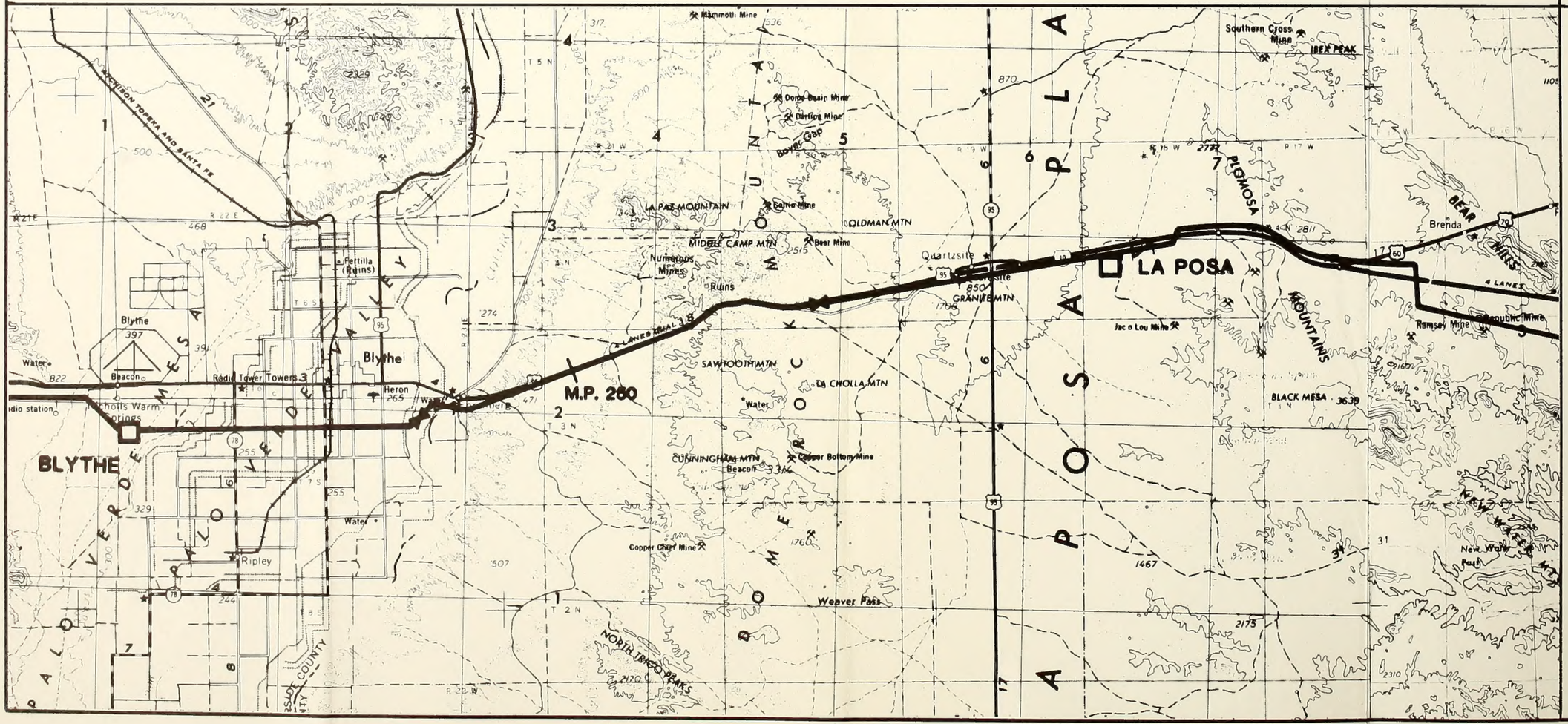
BV

BV

OPEN (CONT.) → RESIDENCES SCHOOL	OPEN →
CHUCKWALLA VALLEY GROUNDWATER BASIN →	
CREOSOTE BUSH SCRUB (CONT.) → WASHES →	(CALIFORNIA SONORAN DESERT) WASH WOODLANDS → CREOSOTE BUSH SCRUB →
DESERT TORTOISE AND BIGHORN SHEEP (CONT.) →	
P F P F P F



	PROJECT AND PIPELINE DETAILS
OPEN — DEVELOP. — OPEN — AGRIC. — OPEN (BV, CV)	**LAND USE**
GW-4 PALO VERDE VERDE VALLEY GROUNDWATER BASIN → COLORADO RIVER; GW-5 LA POSA BASIN →	**HYDROLOGY**
G7 LIQUEFACTION POTENTIAL → ; DOME ROCK MTS. → ; PLOMOSA MTS. →	**GEOLOGY**
96 PALO VERDE AGRICULTURE → ; S7 COLORADO RIVER, FLOODING/EROSION	**SOILS**
CREOSOTE BUSH SCRUB (CONT.) — ALKALAI SINK RIPARIAN VEGETATION — SONORAN CREOSOTE BUSH (LOWER SONORAN DESERT)	**VEGETATION**
COLORADO RIVER – FISHERIES; SENSITIVE RIPARIAN AND WETLANDS HABITATS; YUMA CLAPPER RAIL HABITAT, CALIFORNIA BLACK RAIL, YELLOW-BILLED CUCKOO; DESERT BIGHORN SHEEP	**WILDLIFE**
F P F P F L F L F P F (BV, CV)	**LAND OWNERSHIP**



JUNE 1985

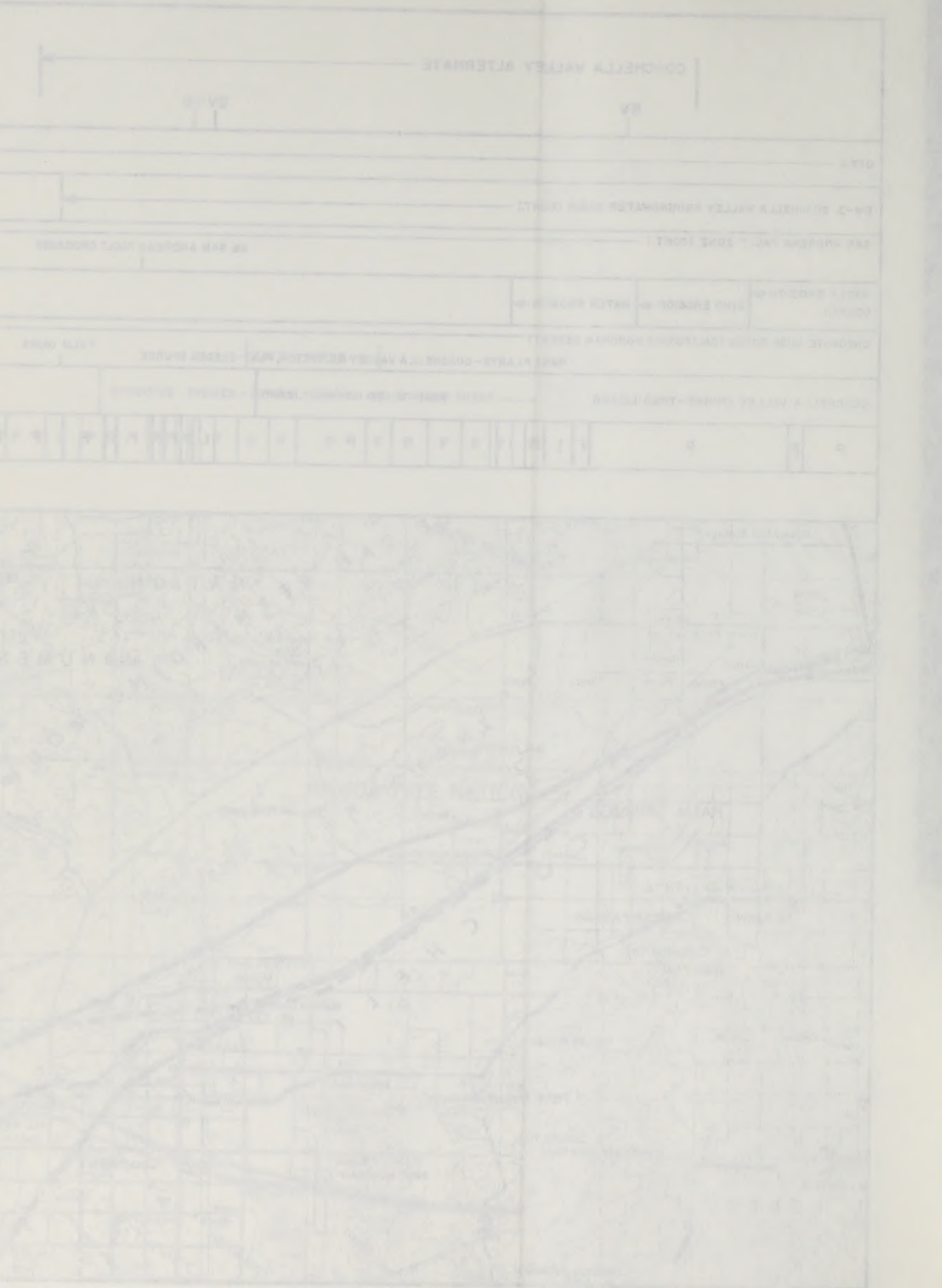
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MAP 5 OF 19

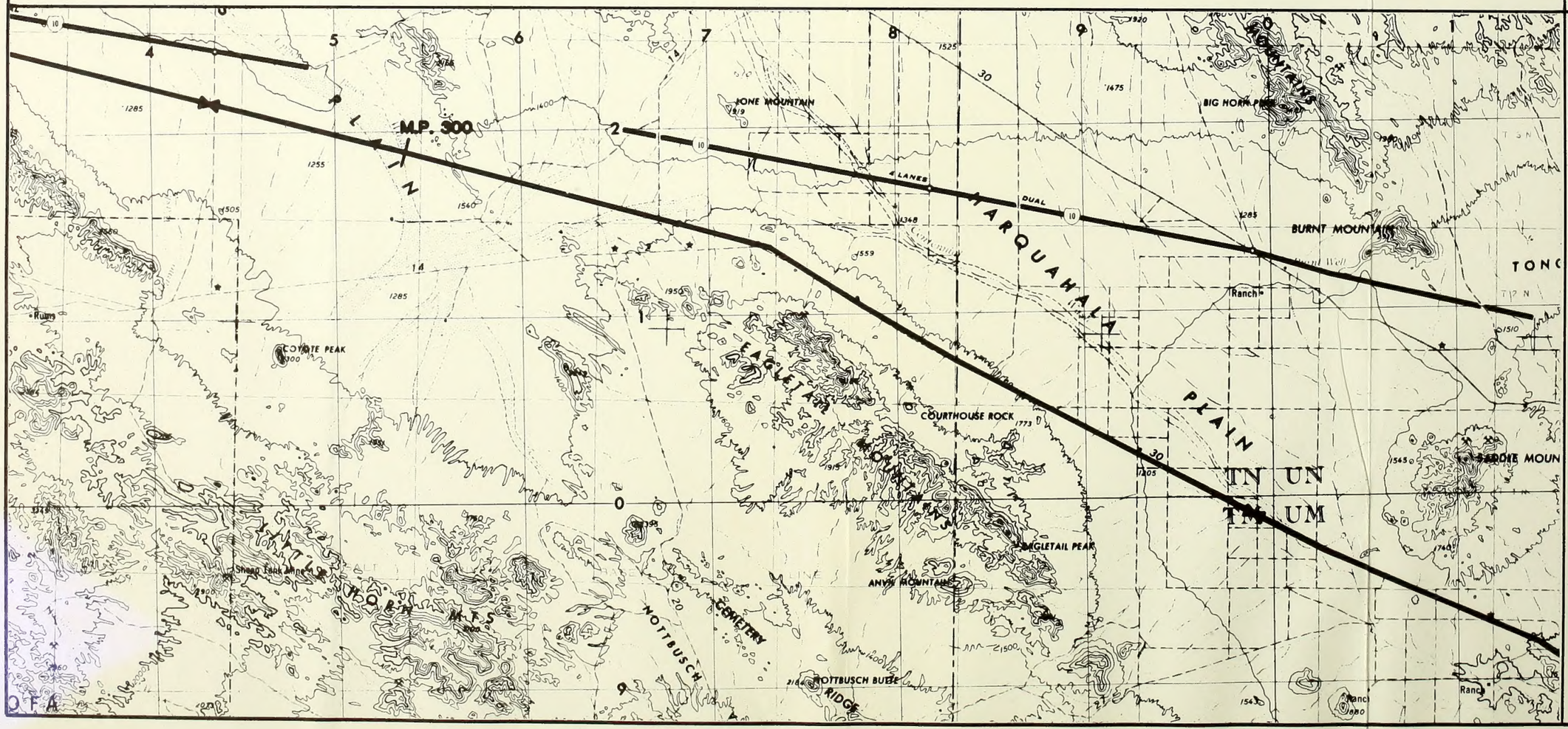
- **F – Federal Land Managed by BLM**
- **I – Indian Land**
- **NF – National Forest Service**
- **DOD – Dept. of Defense**
- **L – Local (State, County)**
- **P – Private**

PACTEX EIR/EIS
PIPELINE ALIGNMENT

ENGINEERING-SCIENCE



BV … OPEN (CONT.) … BV … AGRICULTURE … OPEN	LAND USE
GW-6 CENTENNIAL AREA	HYDROLOGY
EAGLETAIL MOUNTAINS	GEOLOGY
S8 … S9 HARQUAHALA PLAIN	SOILS
SONORAN CREOSOTE BUSH (CONT.)	VEGETATION
	WILDLIFE
F L F L F L F L P L P L P L P L F L F	LAND OWNERSHIP



JUNE 1985

Scale: 1:250,000

MAP 6 OF 19

F – Federal Land Managed by BLM

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DOD – Dept. of Defense

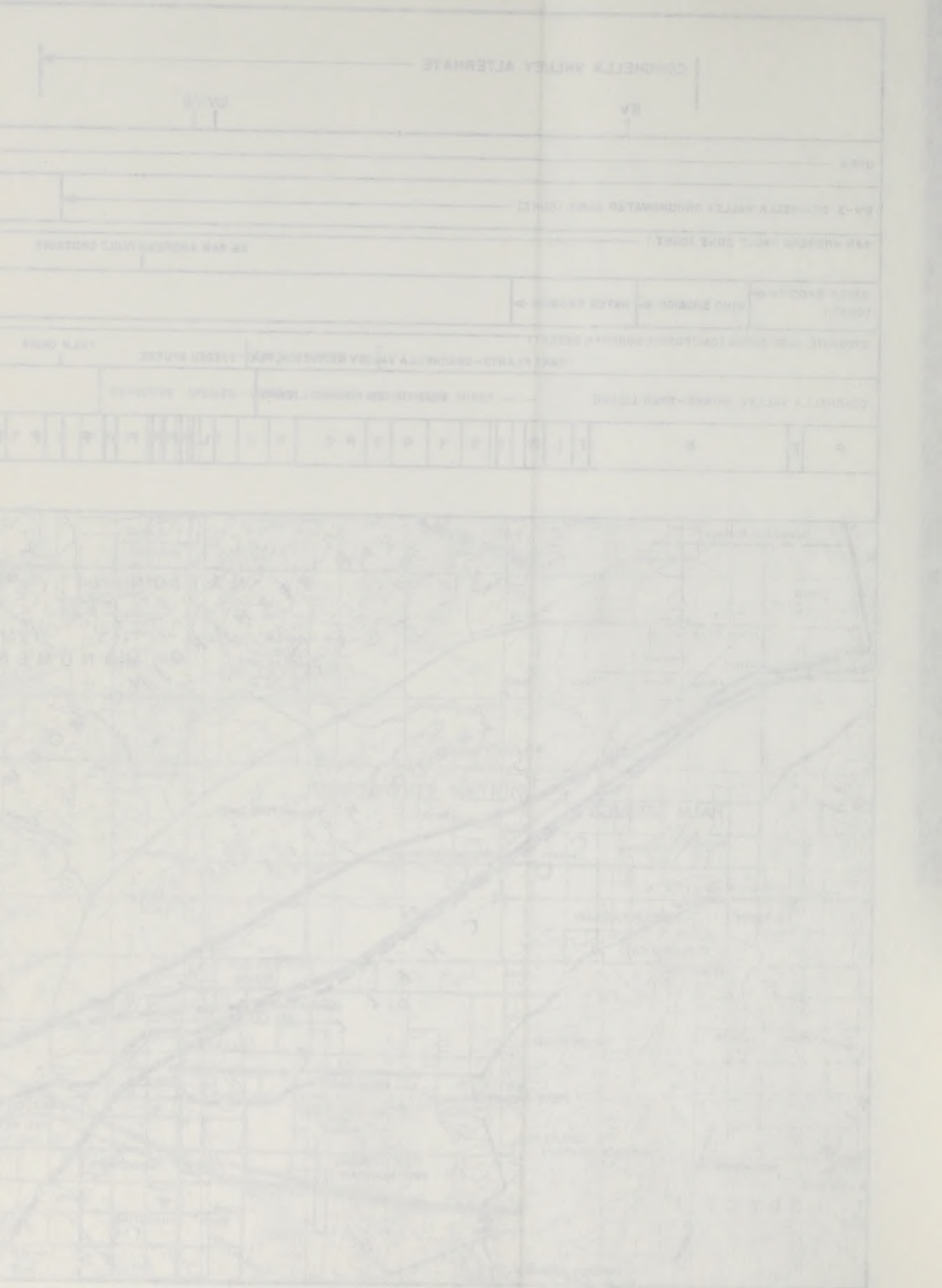
L – Local (State, County)

P – Private

PACTEX EIR/EIS

PIPELINE ALIGNMENT

ENGINEERING-SCIENCE



BV | BV CV | CV | BV

AGRIC. → | OPEN → | AGRICULTURE → | OPEN → | AGRIC. | OPEN →

GILA RIVER

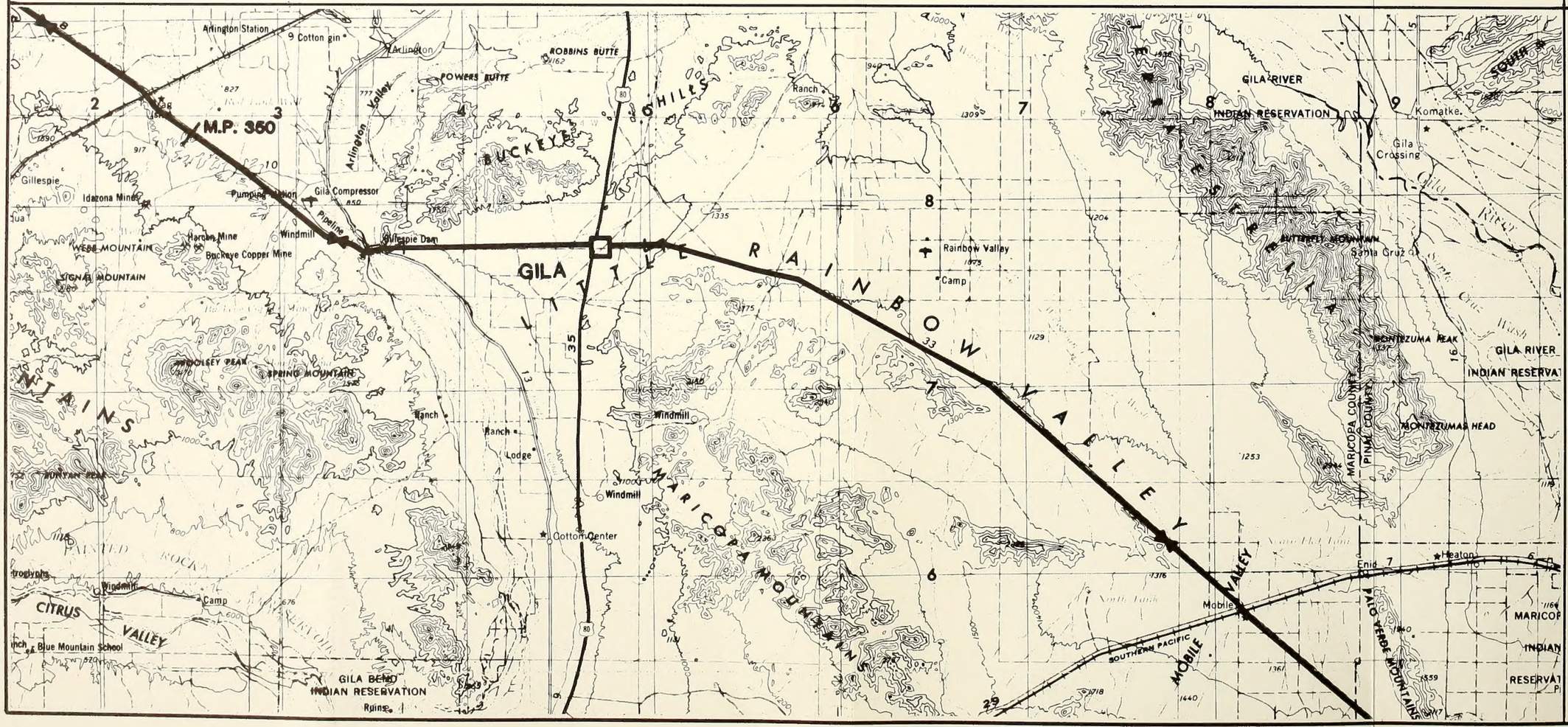
G8 LIQUEFACTION POTENTIAL

S10-FLOODING/EROSION | S11 FLOODING/EROSION →

SONORAN CREOSOTE BUSH (CONT.) → | AGRICULTURE → | SONORAN CREOSOTE BUSH →

GILA RIVER-RECREATIONAL FISH

F | P | L | P | L | F | P | F | P | F | L | F | L | P | F | P | F | P | F | P | F | P



PROJECT AND PIPELINE DETAILS

LAND USE

HYDROLOGY

GEOLOGY

SOILS

VEGETATION

WILDLIFE

LAND OWNERSHIP

JUNE 1985

Scale: 1:250,000

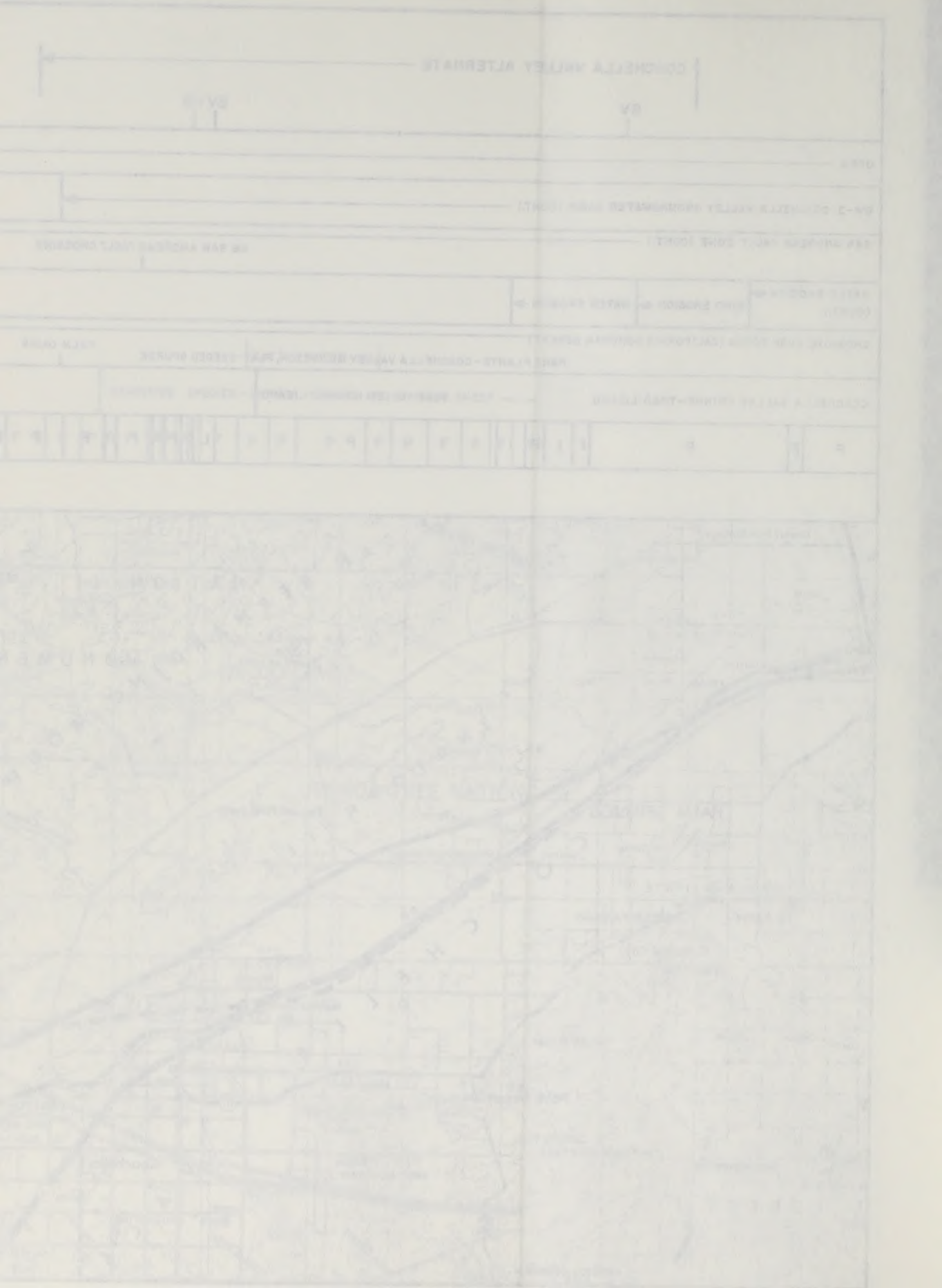
MAP 7 OF 19

- **F** – Federal Land Managed by BLM
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- **L** – Local (State, County)
- **P** – Private

PACTEX EIR/EIS

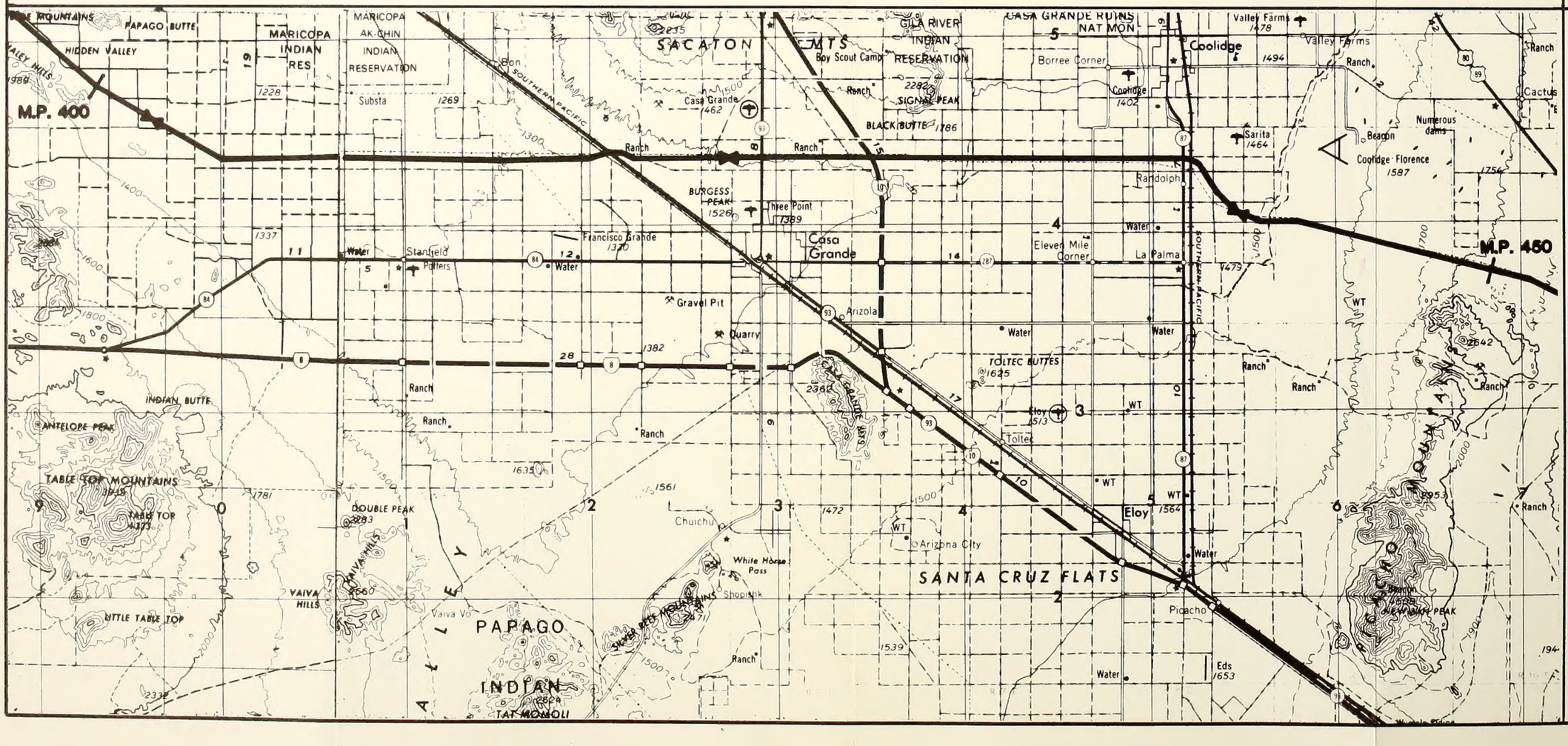
PIPELINE ALIGNMENT

ENGINEERING-SCIENCE



BV BV BV

OPEN — AGRICULTURE — OPEN — AGRICUTURE DEVELOPED — OPEN — AGRICULTURE DEVELOPED — OPEN	LAND USE
GW-7 LOWER SANTA CRUZ VALLEY — SANTA CRUZ RIVER — FLORENCE-CASA GRANDE CANAL	HYDROLOGY
G9 SUBSIDENCE POTENTIAL	GEOLOGY
S11 (CONT.)	SOILS
AGRICULTURE — ARIZONA UPLAND DESERT	VEGETATION
	WILDLIFE
P L P L P F P L P L P L P L P P L P L P	LAND OWNERSHIP



JUNE 1985

Scale: 1:250,000

MAP 8 OF 19

F – Federal Land Managed by BLM

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DOD – Dept. of Defense

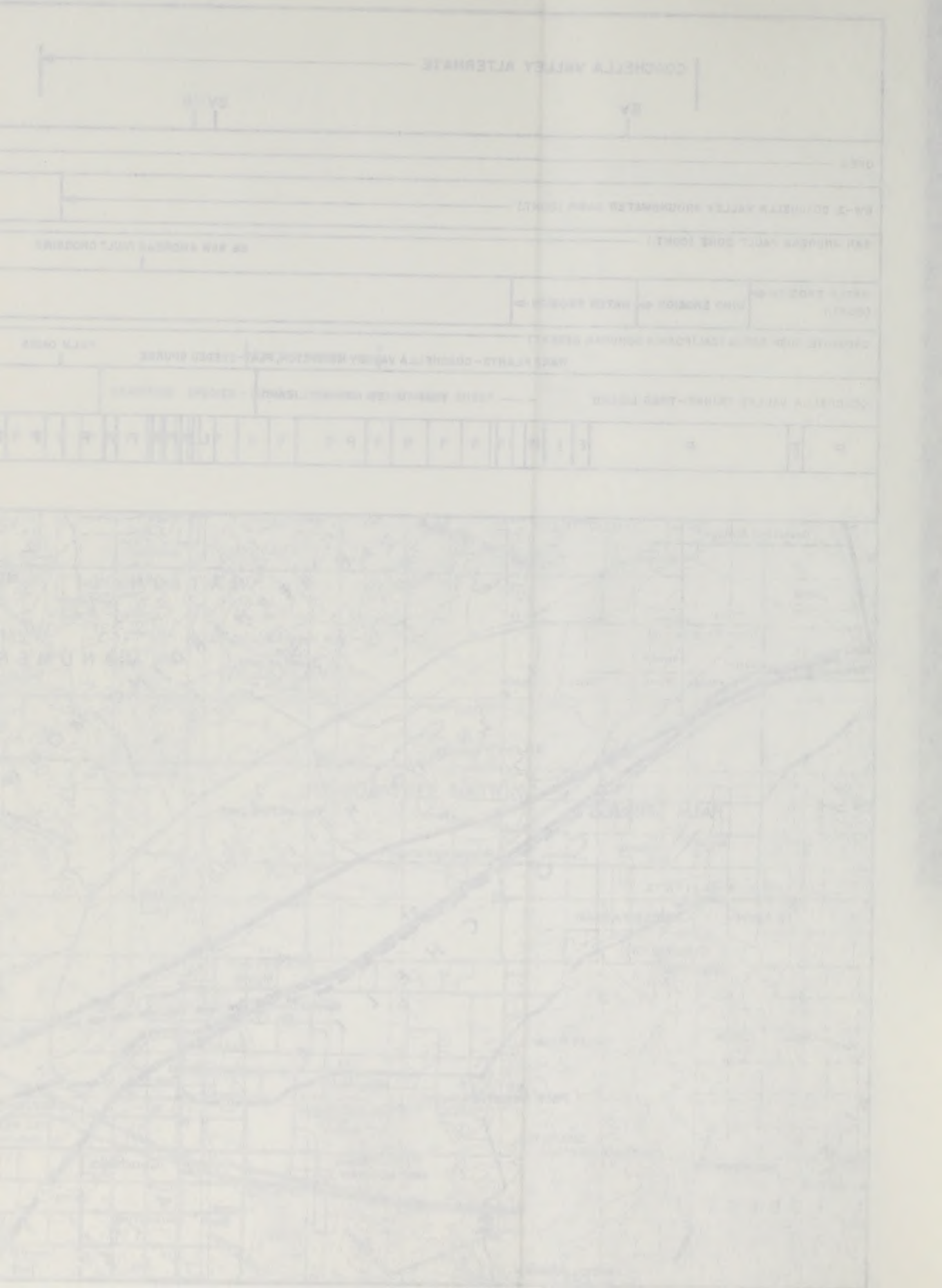
L – Local (State, County)

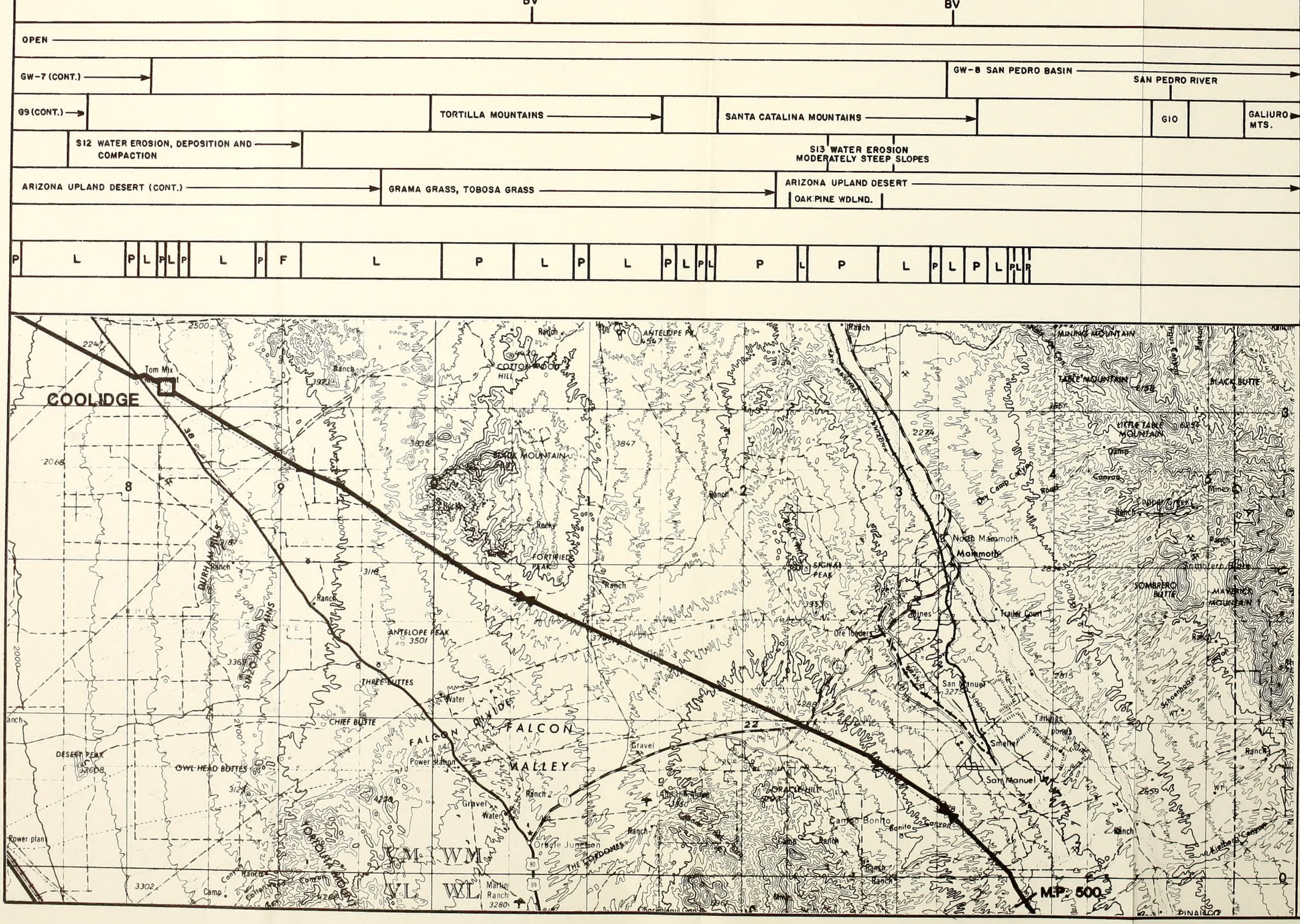
P – Private

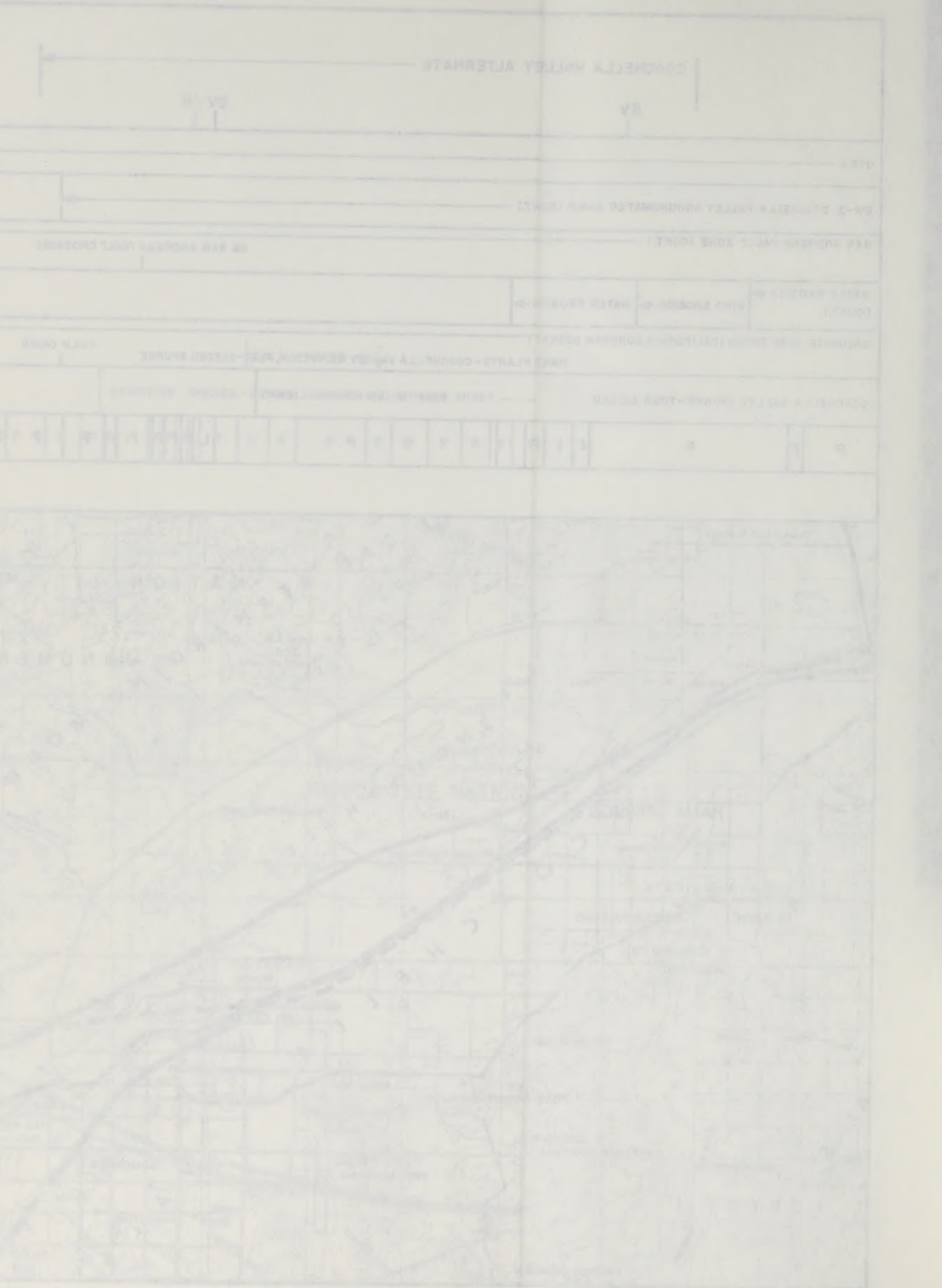
PACTEX EIR/EIS

PIPELINE ALIGNMENT

ENGINEERING-SCIENCE




BV
BV
OPEN
GW-7 (CONT.)
GW-8 SAN PEDRO BASIN
SAN PEDRO RIVER
G9 (CONT.)
TORTILLA MOUNTAINS
SANTA CATALINA MOUNTAINS
G10
GALIURO MTS.
S12 WATER EROSION, DEPOSITION AND COMPACTION
S13 WATER EROSION MODERATELY STEEP SLOPES
ARIZONA UPLAND DESERT (CONT.)
GRAMA GRASS, TOBOSA GRASS
ARIZONA UPLAND DESERT
OAK-PINE WDLND.
P L P L P L P L P F L P L P L P L P



BV BV CV BV BV

OPEN → AGRICULTURE DEVELOPED → OPEN

GW-8 (CONT.) → SAN PEDRO RIVER

GW-9 SULPHUR SPRINGS VALLEY →

G10 LIQUEFACTION POTENTIAL

GALIURO MOUNTAINS →

WINCHESTER MOUNTAINS →

G11 SUBJECT TO SUBSIDENCE →

CABEZAS MTS. →

S14 WATER EROSION STEEP SLOPES

S15 WATER AND WIND EROSION, SALINE SOILS →

S16

ARIZONA UPLAND DESERT (CONT.) →

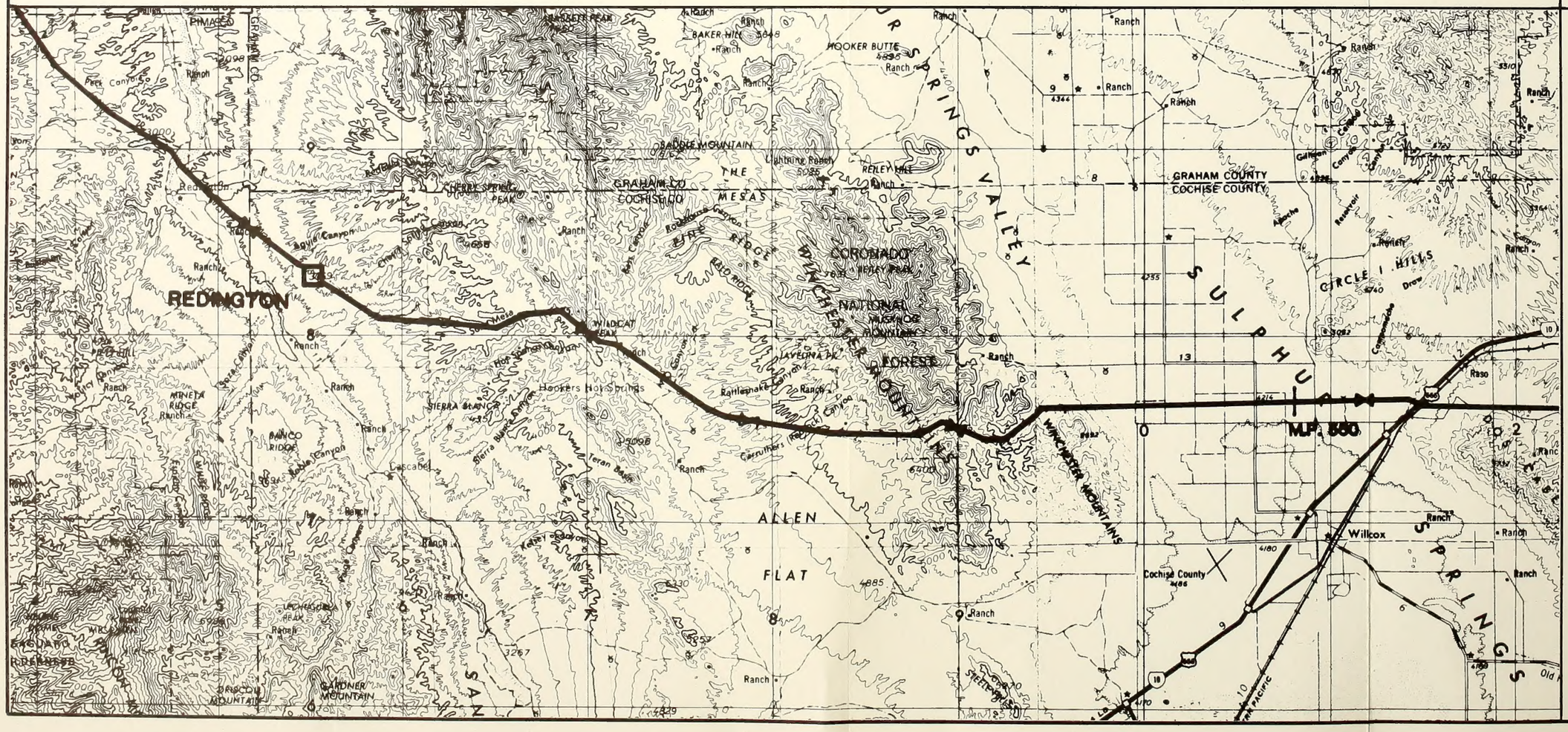
ARIZONA UPLAND AND DESERT GRASSLAND TRANSITION
GRAMA GRASS, YUCCA, CREOSOTE BUSH →

OAK WOODLAND
CHAPARRAL →

MESQUITE GRASSLAND →

MULESHOE RANCH NATURE PRESERVE
RIPARIAN HABITAT; SENSITIVE FISH
GILA CHUB; SENSITIVE BIRDS

L P L P L P L P L P L P L P L F L P L P L P L P L NF F L P L P L P L P L



PROJECT AND PIPELINE DETAILS

LAND USE

HYDROLOGY

GEOLOGY

SOILS

VEGETATION

WILDLIFE

LAND OWNERSHIP

JUNE 1985

Scale: 1:250,000

MAP 10 OF 19

F – Federal Land Managed by BLM

I – Indian Land

NF – National Forest Service

DOD – Dept. of Defense

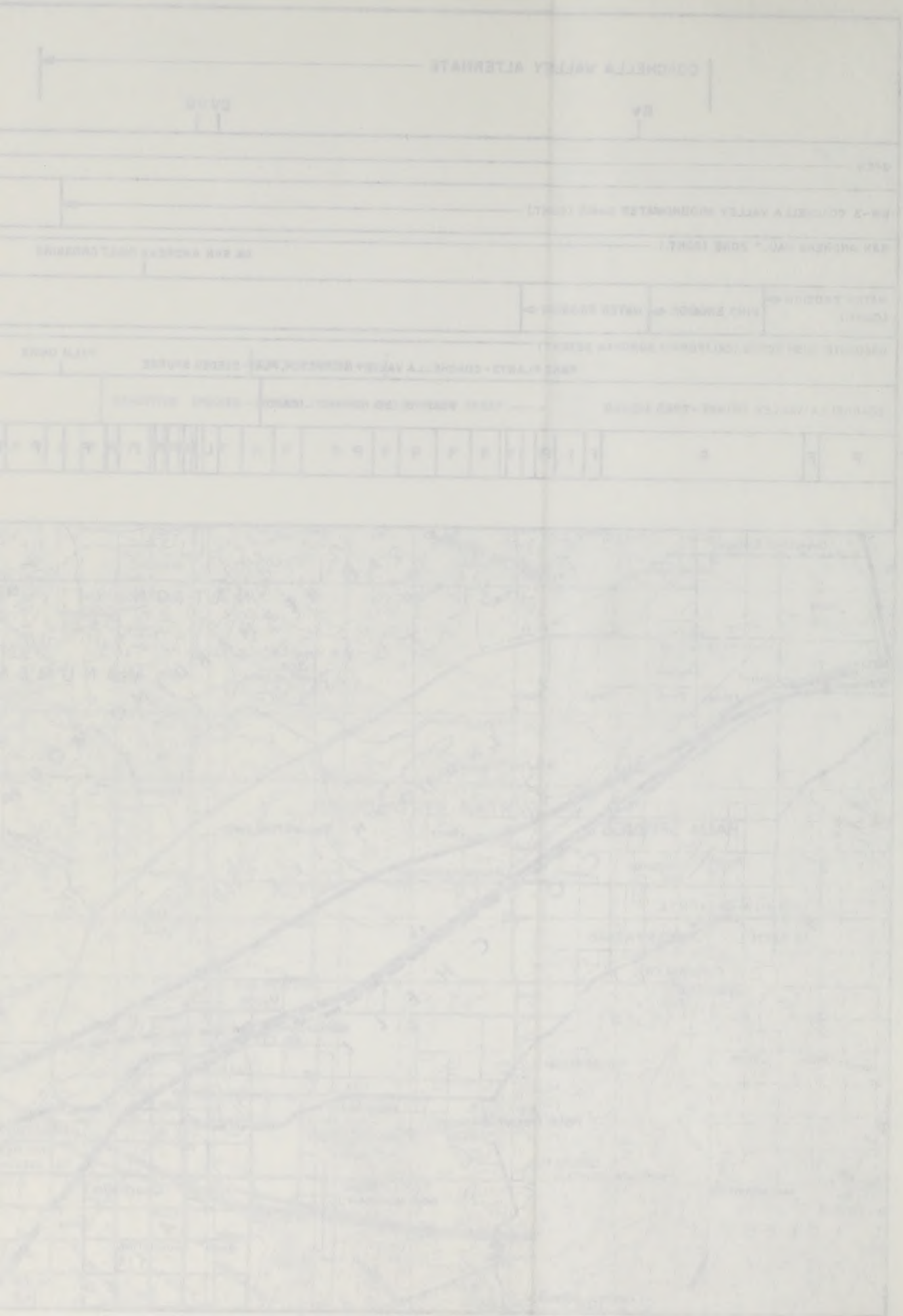
L – Local (State, County)

P – Private

PACTEX EIR/EIS

PIPELINE ALIGNMENT

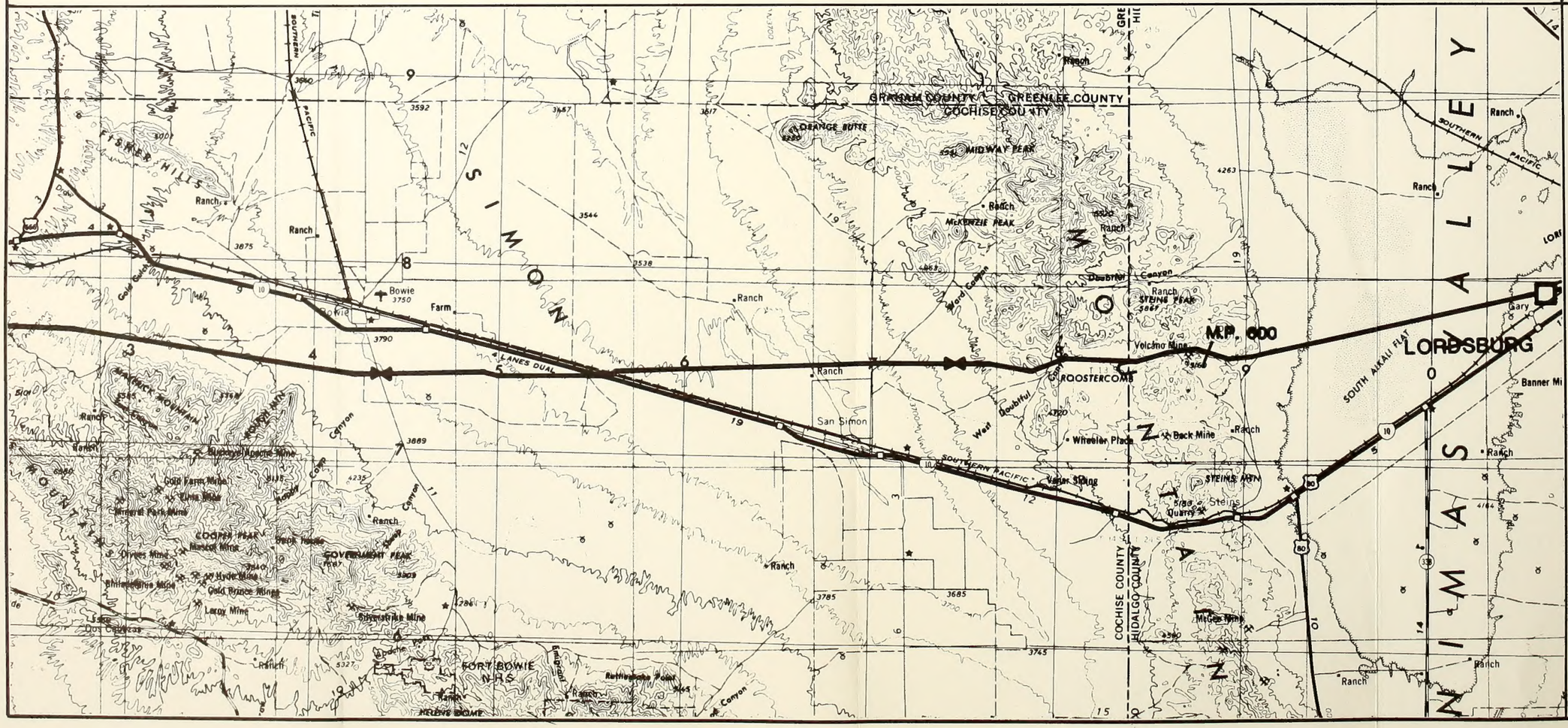
ENGINEERING-SCIENCE



BV

BV

OPEN → AGRICULTURE → OPEN → AGRICULT. → OPEN →	LAND USE
GW-10 SAN SIMON BASIN → SAN SIMON CREEK → GW-11 ANIMAS VALLEY →	HYDROLOGY
CABEZAS MTS (CONT.) → G12 SUBJECT TO SUBSIDENCE →	GEOLOGY
S15 WATER AND WIND EROSION, SALINE SOILS → S16 WATER EROSION STEEP SLOPES, DEPTH TO BEDROCK → S17 REVEGETATION, ALKALINITY ANIMAS VALLEY →	SOILS
DESERT GRASSLAND MESQUITE GRASSLAND → MESQUITE GRASSLAND → SALT PLAYA →	VEGETATION
	WILDLIFE
L F L P L P L F P L F P F P L P L P F L F L P F P L F L F L F P F	LAND OWNERSHIP



PROJECT AND PIPELINE DETAILS

JUNE 1985

Scale: 1:250,000

MAP 11 OF 19

F – Federal Land Managed by BLM

I – Indian Land

NF – National Forest Service

DOD – Dept. of Defense

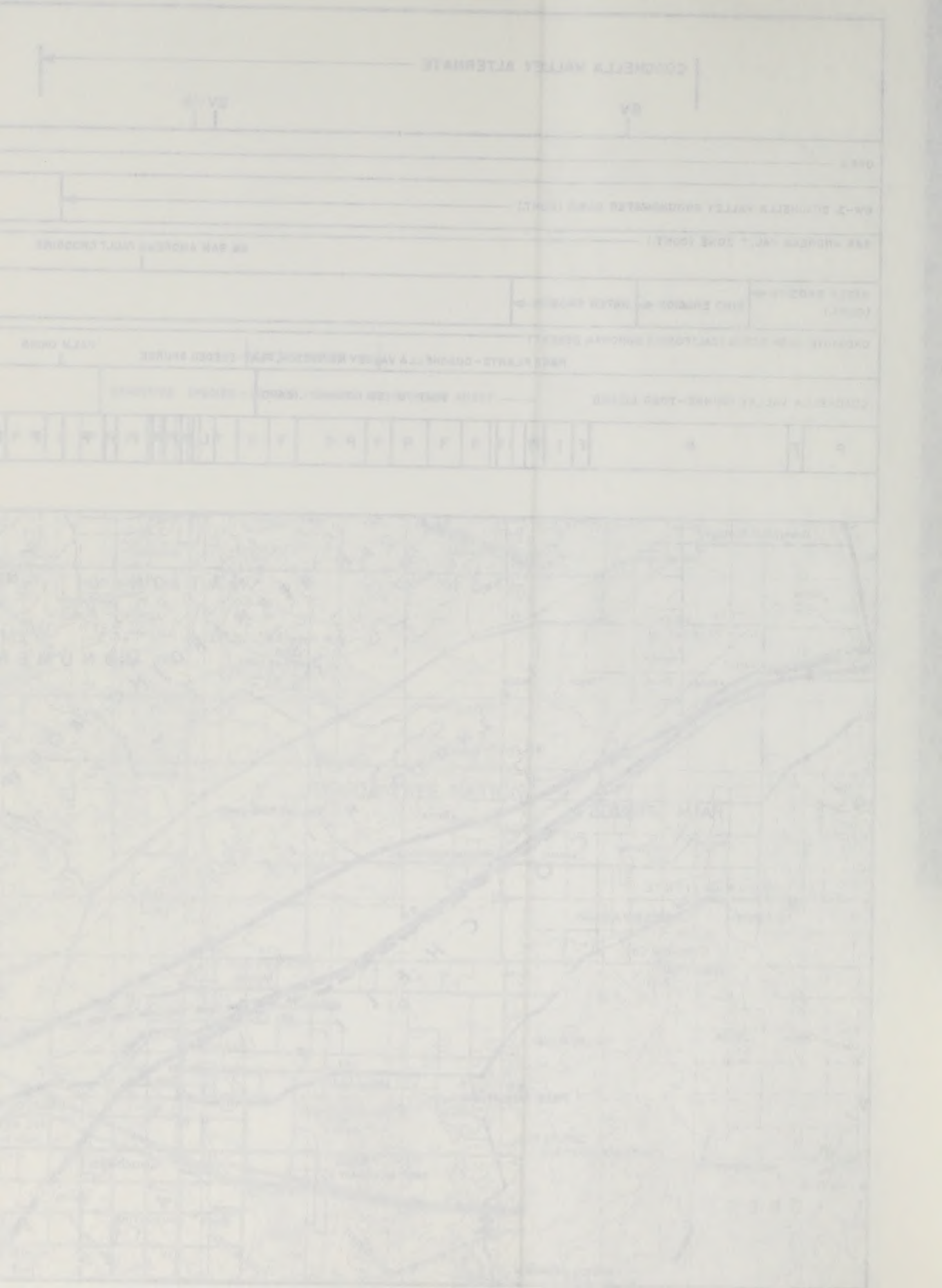
L – Local (State, County)

P – Private

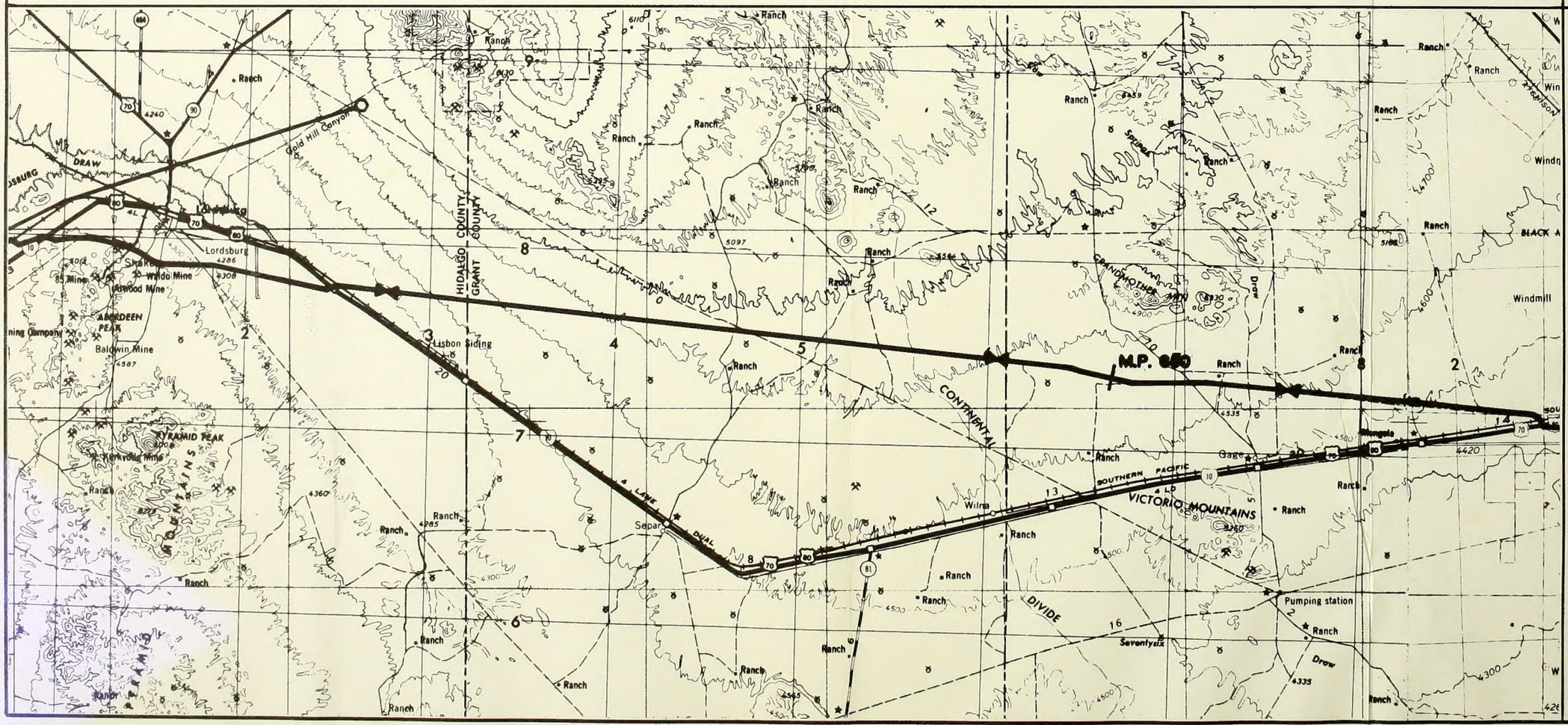
PACTEX EIR/EIS

PIPELINE ALIGNMENT

ENGINEERING-SCIENCE



BV — BV — BV	PROJECT AND PIPELINE DETAILS
AGRICULTURE — DEVELOPED — OPEN → AGRICULTURE →	LAND USE
GW-II LORDSBURG VALLEY →	HYDROLOGY
	GEOLOGY
	SOILS
AGRICULTURE → CHIHUAHUAN CREOSOTE BUSH → (CHIHUAHUAN DESERT) MESQUITE GRASSLAND → AGRICULTURE →	VEGETATION
	WILDLIFE
F L F P L P L P L P L P F L F P L F P L F L L P L P L P F F L P L P L P L P	LAND OWNERSHIP



JUNE 1985

Scale: 1:250,000

MAP 12 OF 19

F – Federal Land Managed by BLM

I – Indian Land

NF – National Forest Service

DOD – Dept. of Defense

L – Local (State, County)

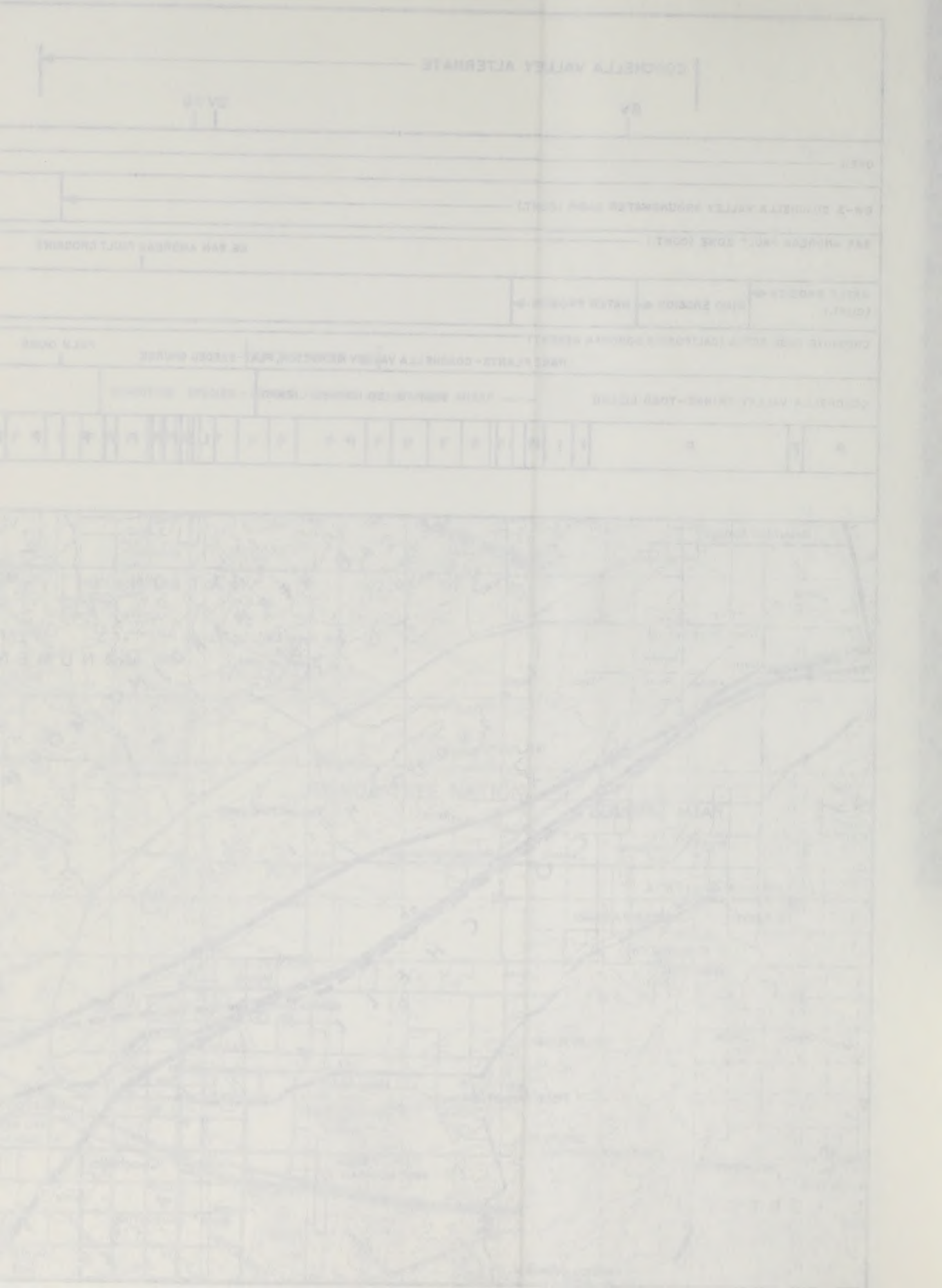
P – Private

Substation and Transmission Line

PACTEX EIR/EIS

PIPELINE ALIGNMENT

ENGINEERING-SCIENCE



BV

AGRICULTURE → | DEVELOPED → OPEN →

GW-12 MIMBRES VALLEY →

S18 HORIZON MIXING, COMPACTION AGRICULTURAL LANDS | S18 → | S19 WIND EROSION → | S20 WIND EROSION

AGRICULTURE → | MESQUITE DUNE →

P | F | L | F | L | F | P | P | L | P | F | P | F | L | F | L | F | L | F | L | F

PROJECT AND PIPELINE DETAILS

LAND USE

HYDROLOGY

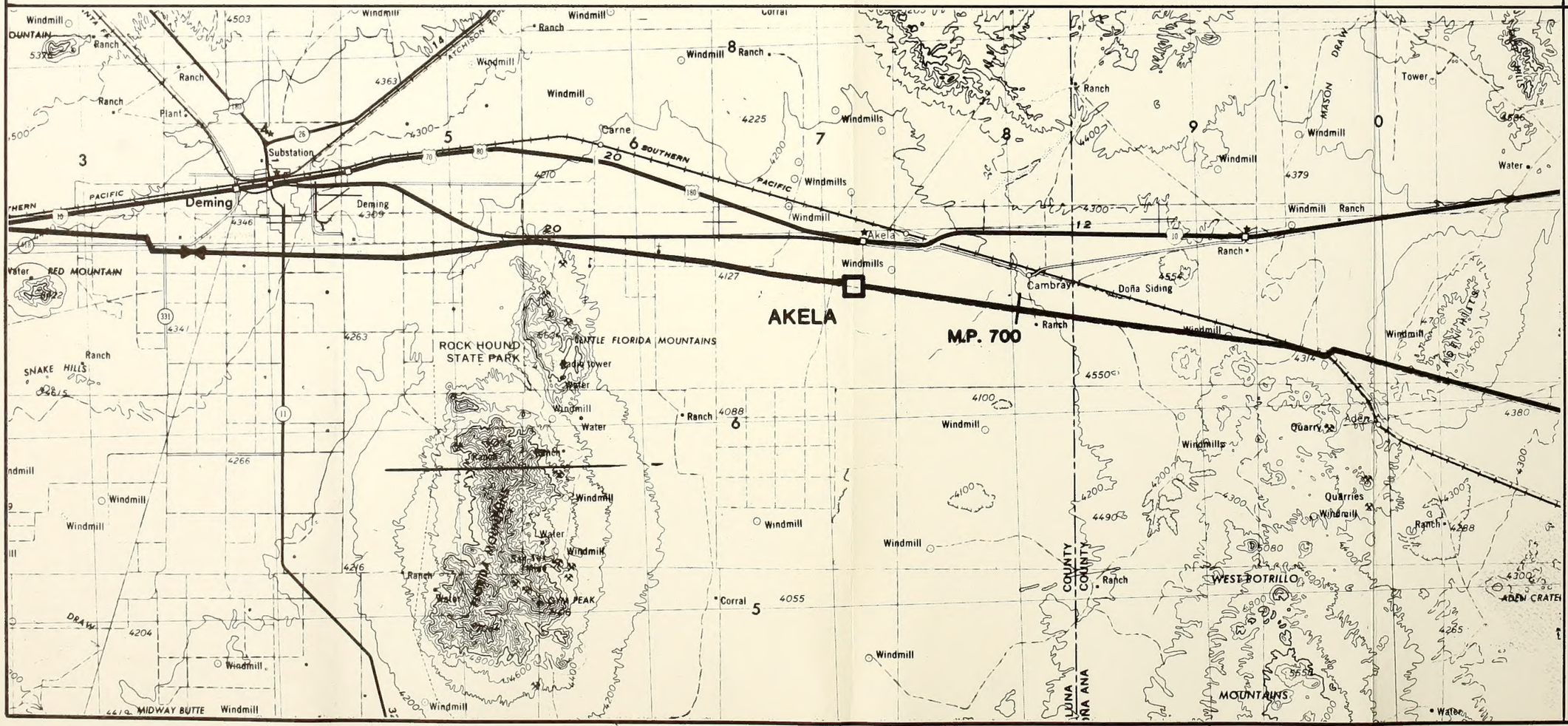
GEOLOGY

SOILS

VEGETATION

WILDLIFE

LAND OWNERSHIP



JUNE 1985

Scale: 1:250,000

MAP 13 OF 19

F – Federal Land Managed by BLM

I – Indian Land

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DOD – Dept. of Defense

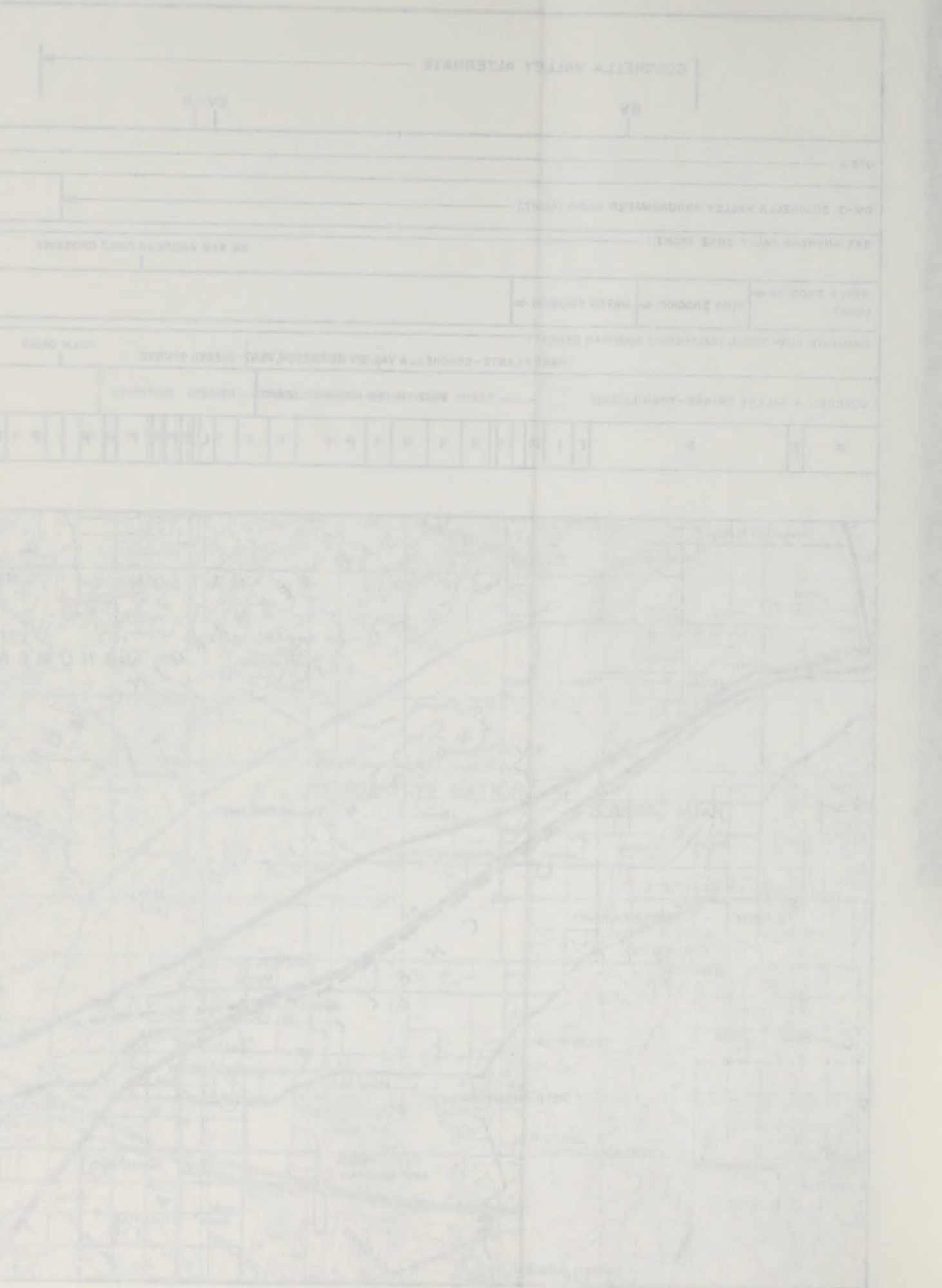
L – Local (State, County)

P – Private

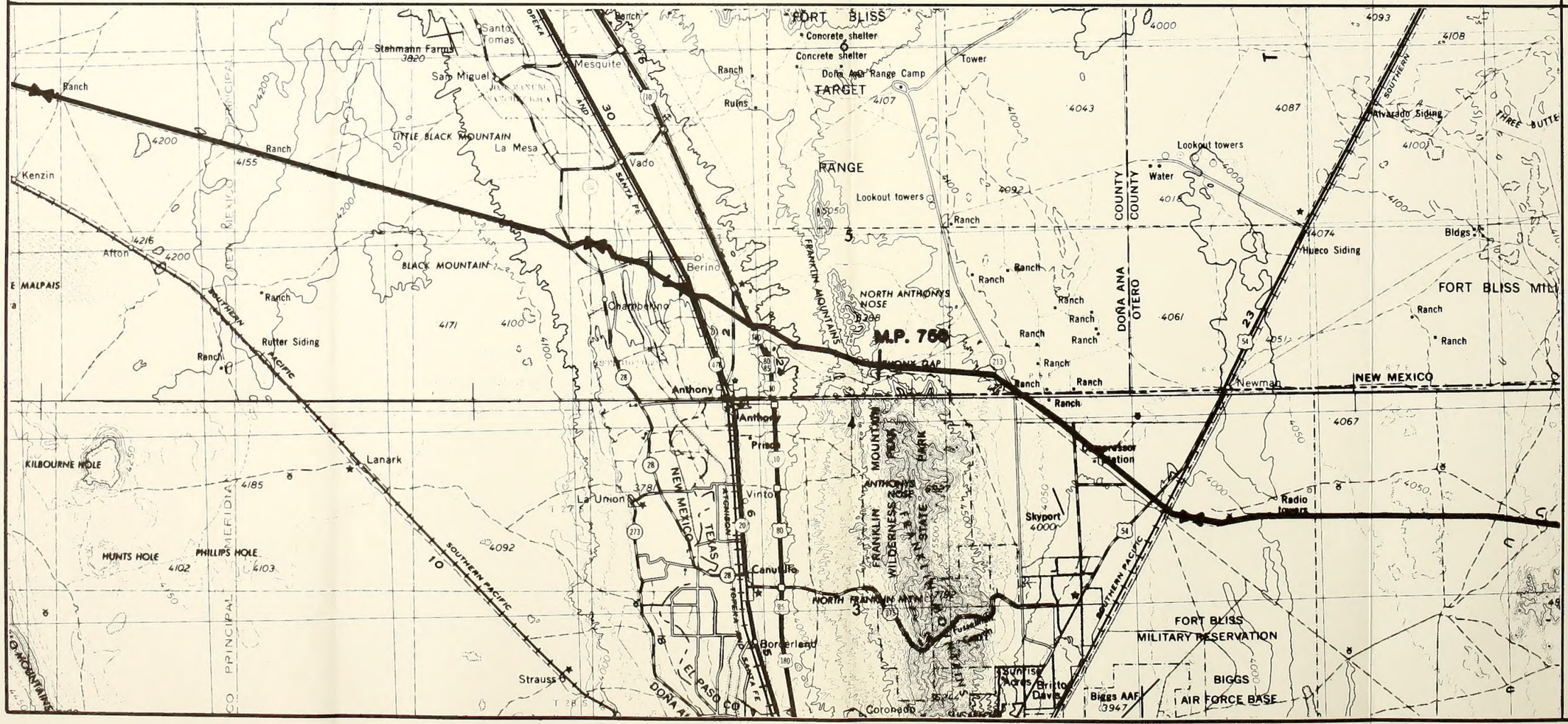
PACTEX EIR/EIS

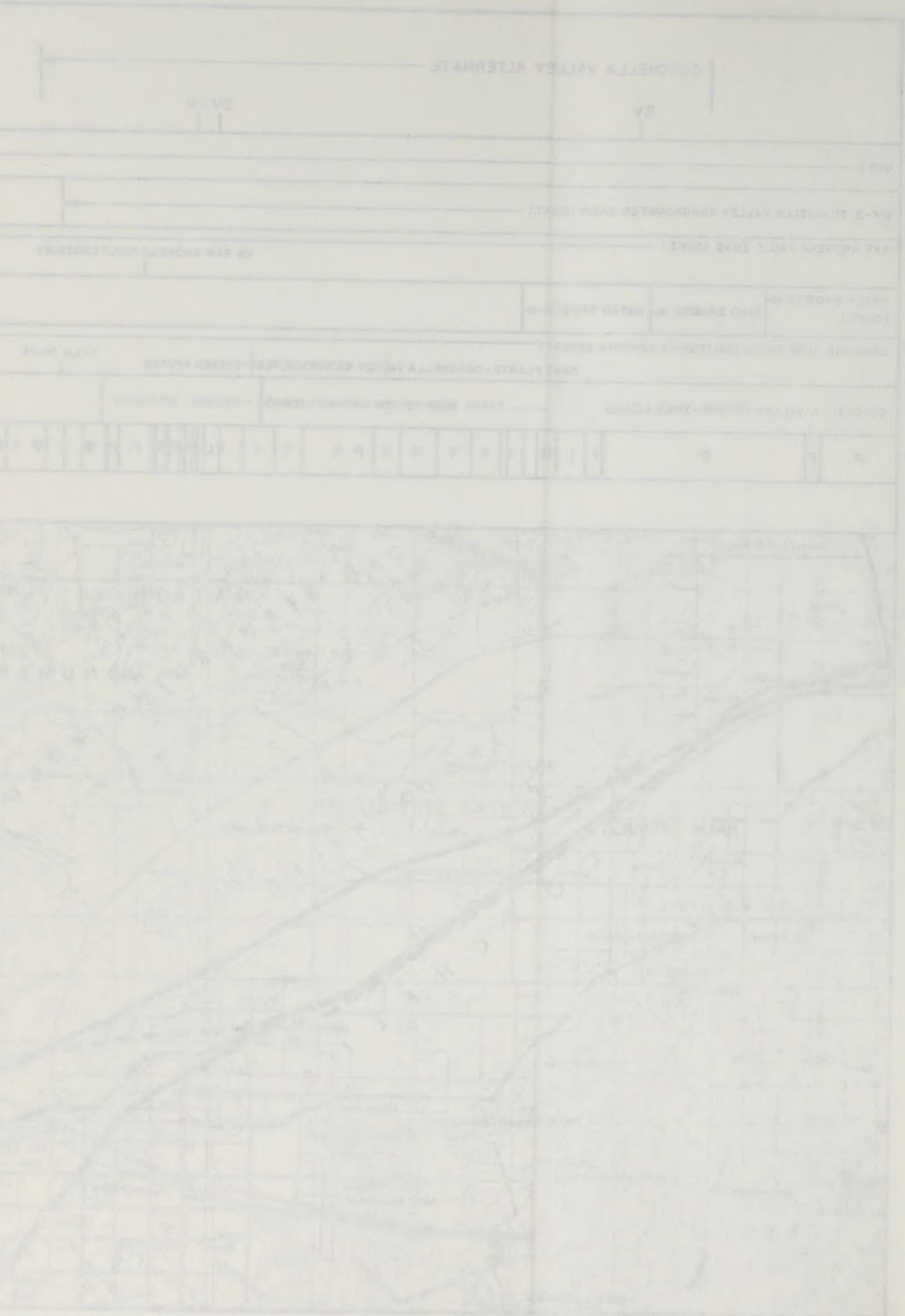
PIPELINE ALIGNMENT

ENGINEERING-SCIENCE



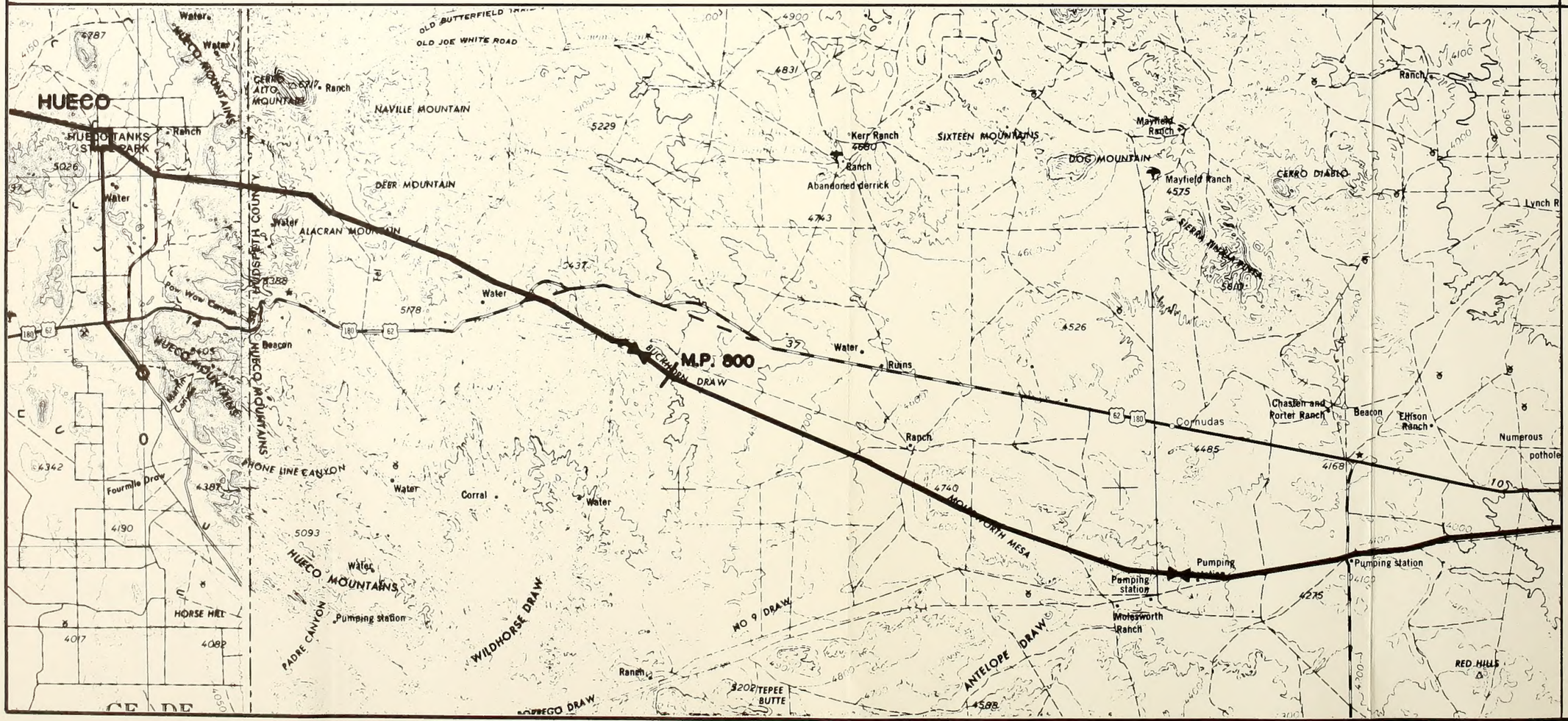
BV — OPEN → BV — AGRICULTURE → CV — OPEN → AGRIC. → BV — OPEN →	LAND USE
GW-13 RIO GRANDE VALLEY RIO GRANDE RIVER →	HYDROLOGY
GI3 LIQUEFACTION/ LURCHING POTENTIAL →	GEOLOGY
S20 WIND EROSION (CONT.) → S21 WATER EROSION S22 WIND EROSION →	SOILS
MESQUITE DUNE (CONT.) → CHIHUAHUAN CREOSOTE BUSH → MESQUITE DUNE →	VEGETATION
RIO GRANDE RIVER RECREATIONAL FISH SENSITIVE SPECIES-MEXICAN TETRA	WILDLIFE
F L P F P F P L F L F P F P P F P F DOD L P	LAND OWNERSHIP


Ranch
Kenzin
Afton
Ranch
Rutter Siding
Ranch
Lanark
Santo Tomas
Stahmann Farms
San Miguel
Mesquite
LITTLE BLACK MOUNTAIN
La Mesa
Vado
BLACK MOUNTAIN
Berino
Chamberino
Anthony
Prisa
La Union
Vinton
Canutillo
Borderland
Strauss
Corralitos
Ranch
Ruins
FORT BLISS
Concrete shelter
Concrete shelter
Dona Ana Range Camp
Tower
TARGET
RANGE
Lookout towers
Ranch
NORTH ANTHONYS NOSE
M.P. 760
ANTHONY GAP
FRANKLIN MOUNTAINS
ANTHONYS NOSE
FRANKLIN MOUNTAINS WILDERNESS STATE PARK
NORTH FRANKLIN MTN.
Tornillo Creek
Sunrise Acres
Brito
Dave
Biggs AAF
DOÑA ANA COUNTY
OTERO COUNTY
Lookout towers
Water
Ranch
Ranch
Ranch



BV	BV
OPEN	
HUECO MTS. →	
S22 (CONT.)	
MESQUITE DUNE (CONT.)	CHIHUAHUAN CREOSOTE BUSH
P	L P L

PROJECT AND PIPELINE DETAILS
LAND USE
HYDROLOGY
GEOLOGY
SOILS
VEGETATION
WILDLIFE
LAND OWNERSHIP



JUNE 1985

Scale: 1:250,000

MAP 15 OF 19

F – Federal Land Managed by BLM

I – Indian Land

NF – National Forest Service

DOD – Dept. of Defense

L – Local (State, County)

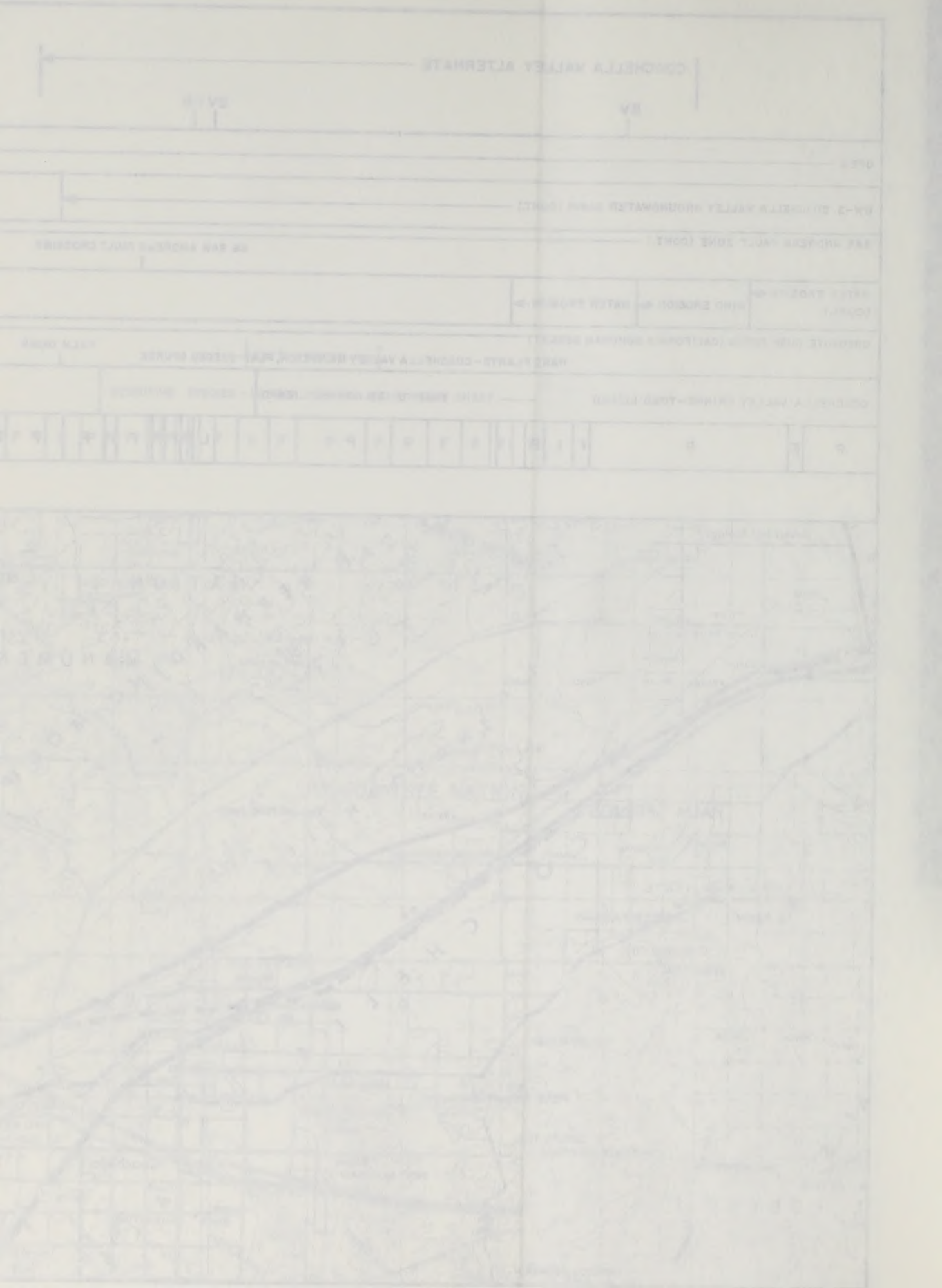
P – Private

Substation and Transmission Line

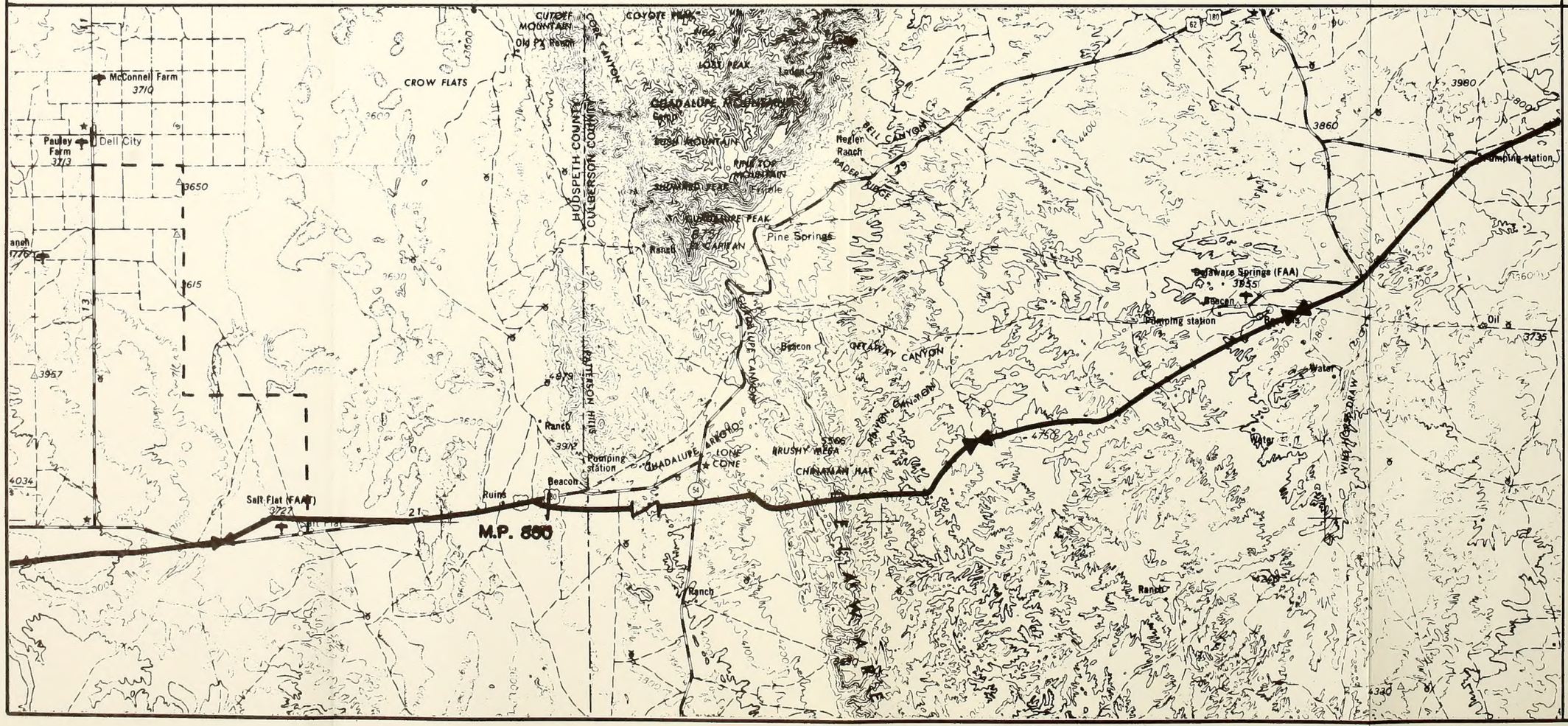
PACTEX EIR/EIS

PIPELINE ALIGNMENT

ENGINEERING-SCIENCE



BV	CV	BV	BV	PROJECT AND PIPELINE DETAILS
OPEN				LAND USE
		GW-14 PECOS RIVER VALLEY		HYDROLOGY
	GUADALUPE MOUNTAINS → G14 →		G15 KARSTIC TERRAIN SOLUTION COLLAPSE	GEOLOGY
	S23 ALKALINE SOILS REVEGETION/FLOODING →			SOILS
CHIHUAHUAN CREOSOTE BUSH →	SALT PLAYA → CHIHUAHUAN CREOSOTE BUSH →	TRANS-PECOS DESERT SCRUB / JUNIPER BRUSH LAND	CHIHUAHUAN CREOSOTE BUSH / JUNIPER BRUSH LAND	VEGETATION
	GYPSUM DUNES NATURE PRESERVE SENSITIVE COMMUNITY			WILDLIFE
L	P			LAND OWNERSHIP



JUNE 1985

Scale: 1:250,000

MAP 16 OF 19

F – Federal Land Managed by BLM

I – Indian Land

NF – National Forest Service

DOD – Dept. of Defense

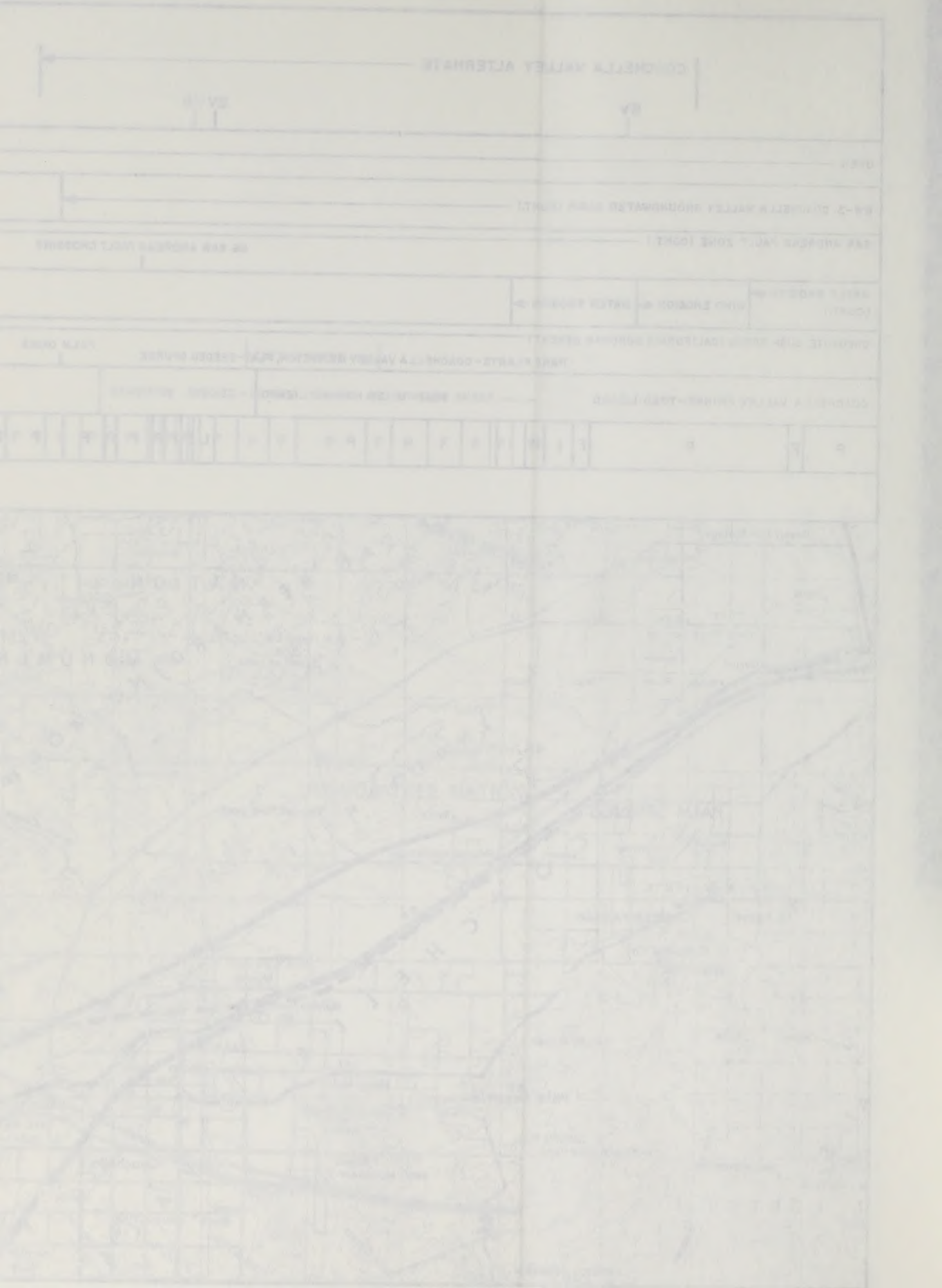
L – Local (State, County)

P – Private

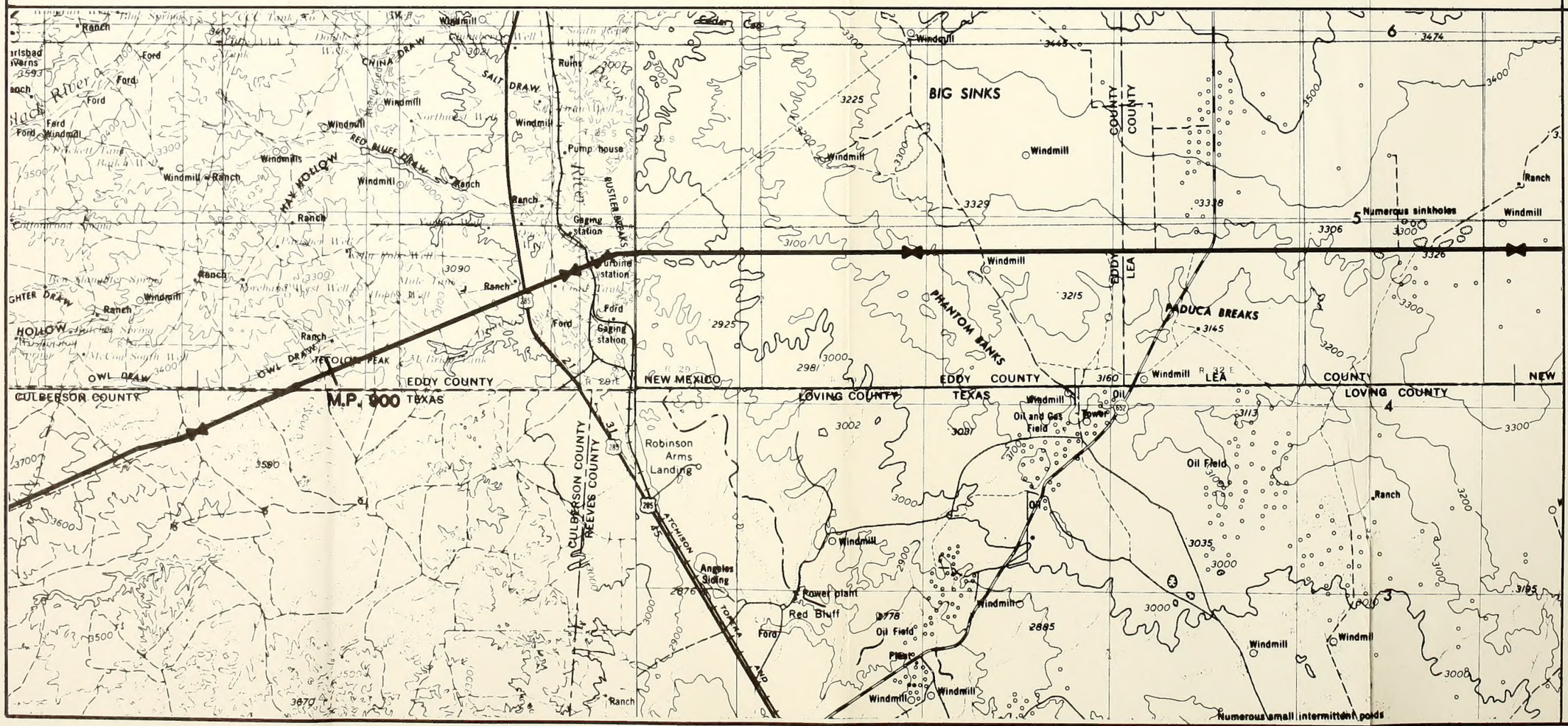
PACTEX EIR/EIS

PIPELINE ALIGNMENT

ENGINEERING-SCIENCE



BV — OPEN — BV CV — AGRICULT. — OPEN — BV — BV	LAND USE
GW-14 PECOS RIVER VALLEY — PECOS RIVER	HYDROLOGY
G15 KARSTIC TERRAIN SOLUTION COLLAPSE (CONT.) → G16 LIQUEFACTION POTENTIAL	GEOLOGY
S24 FLOODING/EROSION	SOILS
CHIHUAHUAN CREOSOTE BUSH (CONT.) — SENSITIVE PLANT LEE'S PINCUSHION CACTUS — SALT CEDAR → CHIHUAHUAN CREOSOTE BUSH AND SHIN-OAK MESQUITE → MESQUITE SNAKEWEED	VEGETATION
PECOS RIVER FISHERIES	WILDLIFE
P — F — L — P — F — P — F — P — F — P — F	LAND OWNERSHIP



PROJECT AND PIPELINE DETAILS

JUNE 1985

Scale: 1:250,000

MAP 17 OF 19

F – Federal Land Managed by BLM

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DOD – Dept. of Defense

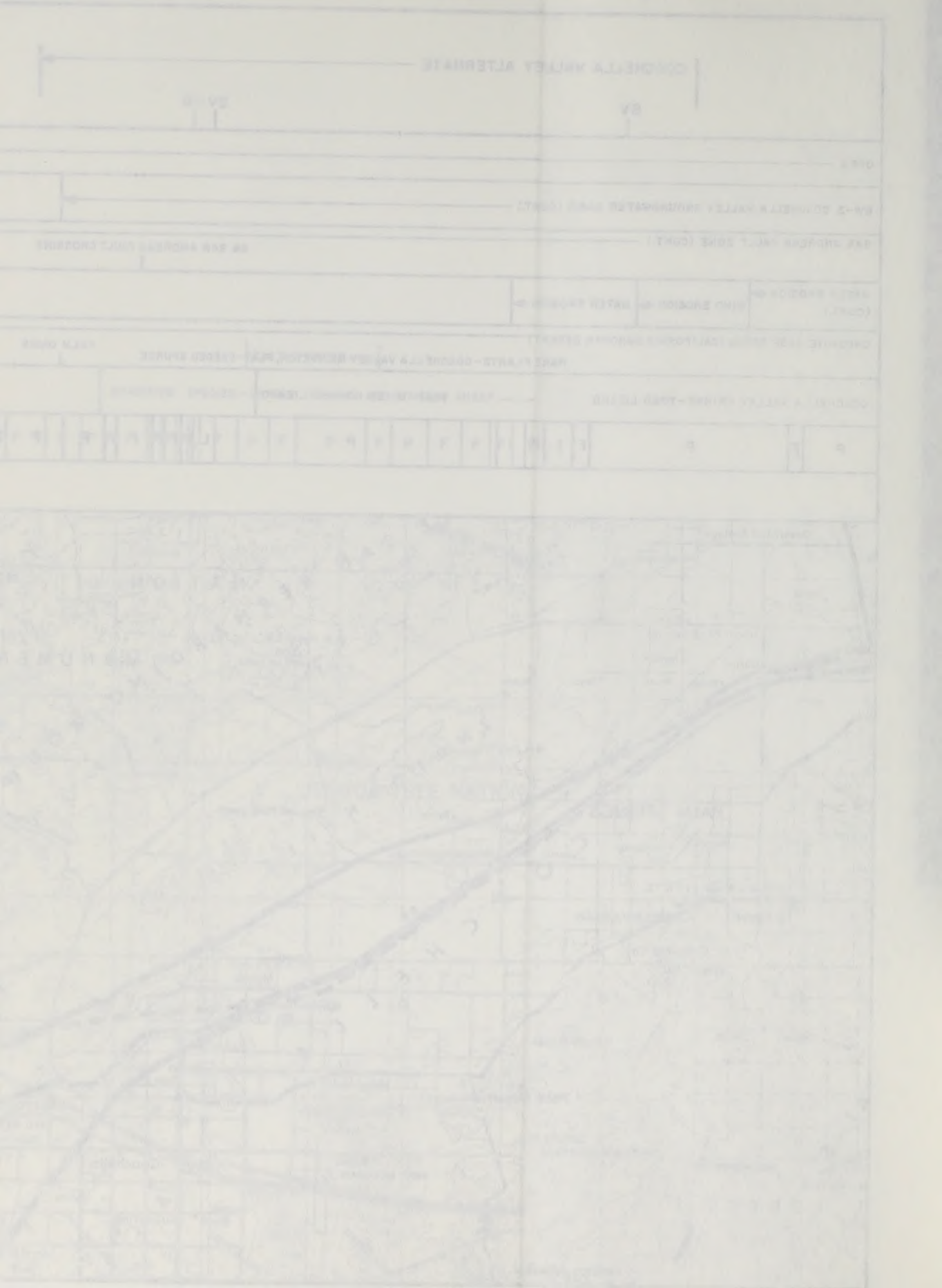
L – Local (State, County)

P – Private

PACTEX EIR/EIS

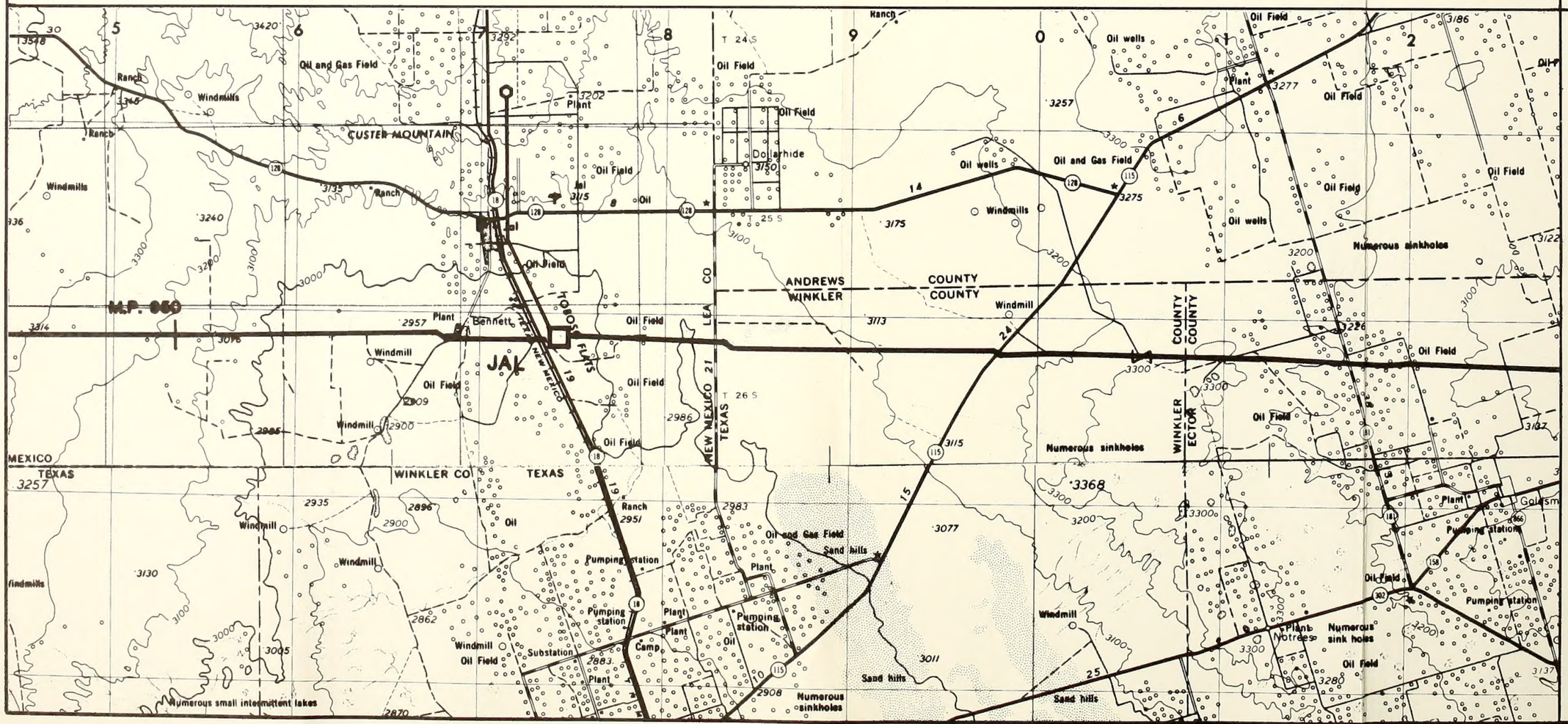
PIPELINE ALIGNMENT

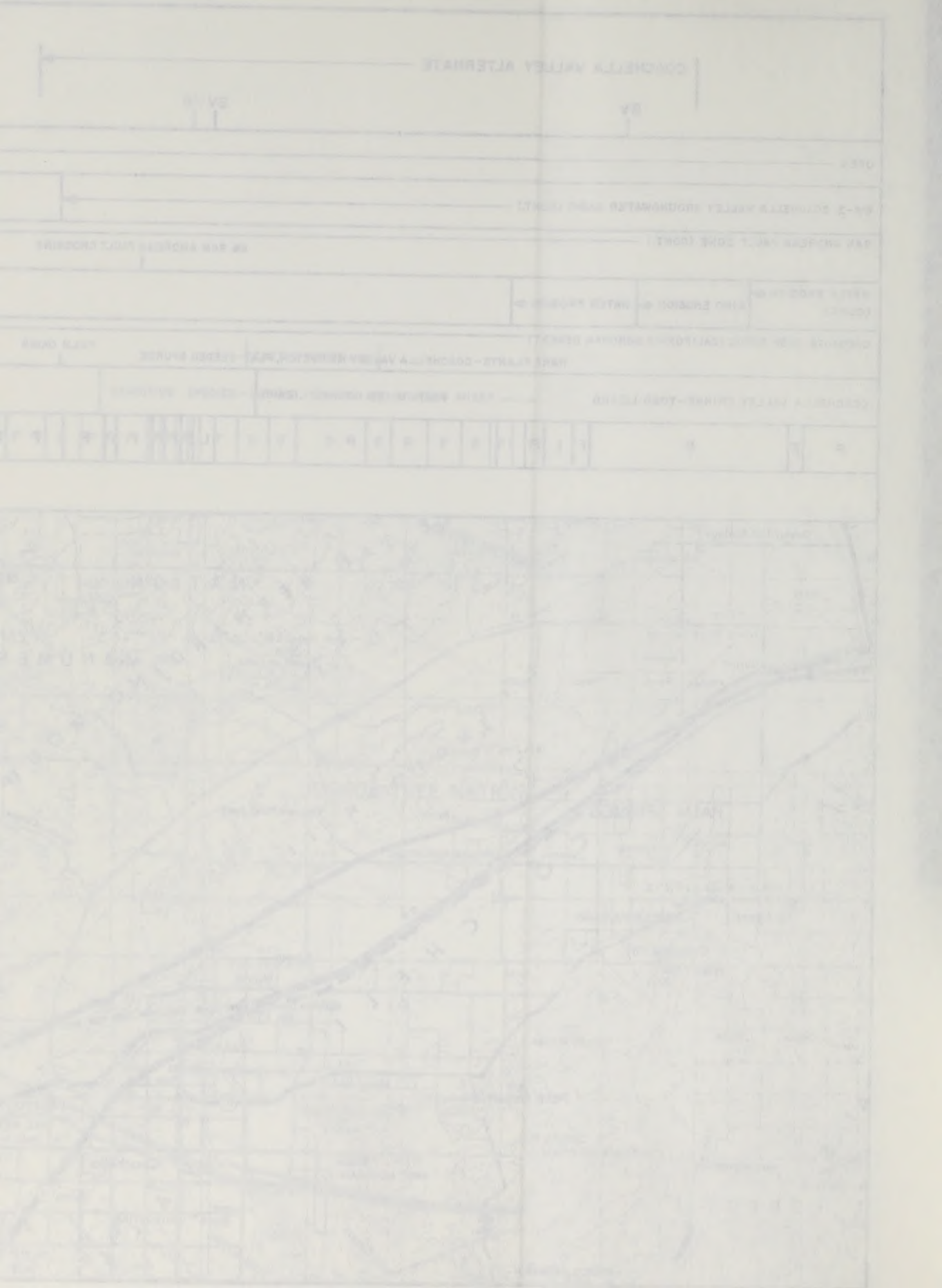
ENGINEERING-SCIENCE



CV

OPEN (CONT.)	LAND USE
GW-14 PECOS RIVER VALLEY (CONT.) / GW-15 TEXAS BASIN / MIDLAND AREA	HYDROLOGY
	GEOLOGY
SAND DUNES / WIND EROSION	SOILS
MESQUITE-SNAKEWEED (CONT.) / SEMI-ARID SHORT GRASS PRAIRIE / SHIN-OAK MESQUITE / MESQUITE DUNE	VEGETATION
	WILDLIFE
F | P | L | P | F | P	LAND OWNERSHIP


M.P. 660
JAL
NEW MEXICO
TEXAS
LEA CO
ANDREWS COUNTY
WINKLER COUNTY
MEXICO
TEXAS
WINKLER CO
TEXAS
CUSTER MOUNTAIN
Oil and Gas Field
Oil Field
Oil wells
Windmills
Windmill
Ranch
Plant
Pumping station
Substation
Camp
Sand hills
Numerous sinkholes
Numerous small intermittent lakes
Dollarhide
Bennett
Gulf
Oil
Gas
Pipeline
Pumping station
Plant
Numerous sink holes
Oil Field
Windmill
Sand hills
Numerous sinkholes
Oil wells
Oil and Gas Field
Oil Field



BV

BV

OPEN (CONT.)

DEVELOPED - RESIDENCES

GW-14 (CONT.)

GW-15 TEXAS BASIN/MIDLAND AREA

MIDLAND WASH

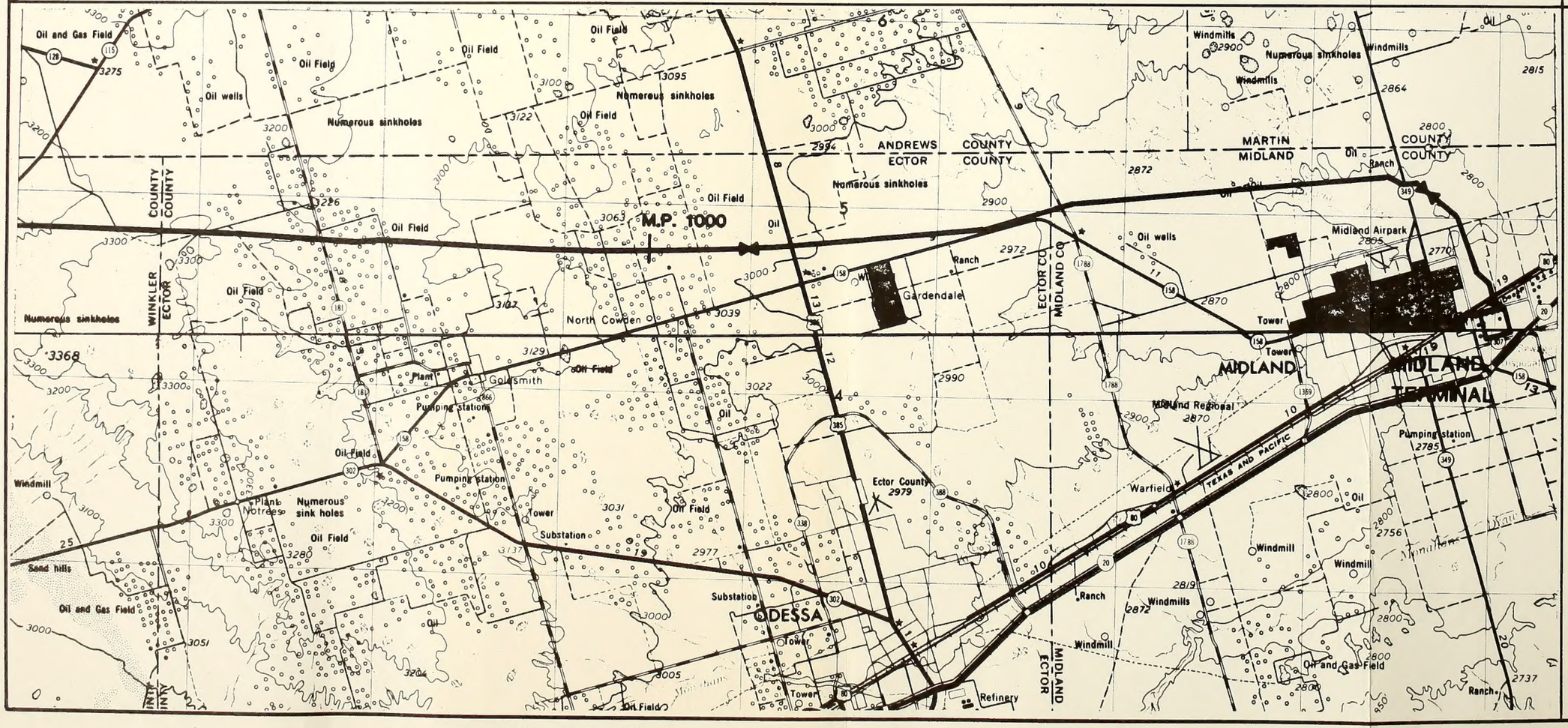
SAND DUNES AND WIND EROSION

SHIN-OAK MESQUITE MESQUITE DUNE

MESQUITE-SNAKEWEED

SEMI-ARID SHORT GRASS PRAIRIE

P



JUNE 1985

Scale: 1:250,000

MAP 19 OF 19

F - Federal Land Managed by BLM

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NF - National Forest Service

DOD - Dept. of Defense

L - Local (State, County)

P - Private

PACTEX EIR/EIS

PIPELINE ALIGNMENT

ENGINEERING-SCIENCE

PROJECT AND PIPELINE DETAILS

LAND USE

HYDROLOGY

GEOLOGY

SOILS

VEGETATION

WILDLIFE

LAND OWNERSHIP

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Denver, CO 80225-0047

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(June 1984)

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